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NOTINI (G.). **Undersökningar rörande på rödklöver levande spetsvivlar (*Apion* Herbst). 1. Deras förekomst levnadssätt och utvecklingshistoria.** [Investigation of Red Clover Weevils (*Apion*, Hbst.). 1. Their Occurrence and Life-history.]—*Medd. Växtskyddsanst.* no. 9, 63 pp., 1 pl., 27 figs., 5 pp. refs. Stockholm 1935. (With a Summary in German.)

Outbreaks of weevils on red clover [*Trifolium pratense*] in Sweden, particularly in the south, have occurred between 1911 and 1934. *Apion apricans*, Hbst., is the most widely distributed and generally the most important species, though *A. aestivum*, Germ., appears to predominate in some parts, and *A. varipes*, Germ., which attacks the lateral shoots, is important to the south of Lake Wener and Lake Wetter. *A. flavipes*, Payk., does some slight damage to clover, but *A. assimile*, Kby., *A. seniculus*, Kby., and *A. virens*, Hbst., seem to be of negligible importance. All stages of these species are described. Oviposition by *A. apricans* and *A. aestivum* begins when the first clover buds appear, the date varying in different parts of the country from the end of June to the middle of July. The egg stage of *A. apricans* lasts 7–10 days, the larval about 17–19 and the pupal 8–9 days. The life-cycle of *A. aestivum* requires only 24–30 days. *A. varipes* begins to oviposit a month earlier than *A. apricans* and *A. aestivum*, and as no blossom is available on cultivated or wild clover when the eggs are laid, the greater part of the larval stage is passed in the vegetative parts of the plant. The egg stage lasts 9–10 days, the larval 19–36, and the pupal stage 8–11 days. The great variation in the length of the larval stage is due to fluctuations in the supply of food. Larvae that hatch early cause so much injury to the side shoots that growth is arrested and food-supply correspondingly reduced, but those that hatch later do not entirely stop the growth of the shoots. These three weevils have only one generation a year in Sweden [*cf. R.A.E.*, A **17** 439].

The average number of seeds and ovules injured by a larva was estimated at 7·85. More ovules are destroyed by larvae that hatch early than by those that hatch later when the seeds and ovules contain more nourishment. The larvae of *A. apricans* and *A. aestivum* are parasitised in Sweden by *Pteromalus* sp. and by the Braconid, *Triaspis* (*Sigalphus*) *caudatus*, Nees. The Pteromalid, which in southern Sweden parasitises as many as 30 per cent. of the larvae and is distributed throughout the country, is more important than the Braconid, which does not appear to occur north of Stockholm.

MÜHLOW (J.). **Studier och försök rörande vetemyggorna *Contarinia tritici* Kirby och *Clinodiplosis mosellana* Géh. samt deras bekämpande. I. Vetemygglarvernas skadegörelse i Sverige åren 1931–1934 samt studier över olika vetesorters angreppsgrad.** [Studies and Research on the Wheat Gall-midges, *C. tritici* and *Sitodiplosis mosellana*, and their Control. I. Injury caused by the Larvae of *C. tritici* in Sweden in 1931–1934 and Studies on the Degree of Attack in different Varieties of Wheat.]—*Medd. Växtskyddsanst.* no. 10, 74 pp., 20 figs., 28 refs. Stockholm, 1935. (With a Summary in German.)

In view of outbreaks of wheat gall-midges in Sweden in 1929–1931, an investigation was begun in 1931. Samples of ears from large fields and small experimental plots were examined. Of the two species concerned, *Contarinia tritici*, Kirby (yellow wheat gall-midge) is the

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more important. It is most numerous during the period when the ears are forming, whereas *Sitodiplosis* (*Clinodiplosis*) *mosellana*, Géh. (red wheat gall-midge) only occurs in numbers afterwards. The eggs of *C. tritici*, which are laid in groups of 8–10 in the blossom glumes, hatch in about 8 days. After about 20 days the larvae leave the ears in damp weather and enter the ground, where they overwinter in a cocoon about 1½ ins. below the surface. In spring some of them move upwards to the soil surface to pupate, but many remain in the cocoon and do not pupate till the second or sometimes the third year. The females migrate to the wheat fields, flying high with the wind. The numbers caught in traps placed in various fields at different heights above the ground are recorded. *C. tritici* is thought to cause at least 90 per cent. of the damage to the ears.

Data are given to show the distribution of the gall-midges in cultivated wheat fields throughout Sweden, and the relative susceptibility of different varieties of wheat. The borders of fields are seldom more heavily infested than any other part, and where the wheat field is adjacent to the field in which emergence took place, the nearest edge is not usually more damaged. The rate at which the ears form in different varieties of wheat is shown. As the gall-midges oviposit in the ear only when it is emerging from the sheath, varieties of wheat that form the ear rapidly will suffer less injury. Attempts to condition the rate of ear formation by fertilisers gave negative results.

AHLBERG (O.). **Plommonstekeln. Ett Observandum för våra Fruktodlare.** [Plum Sawflies. An Observation on Orchard Work in Spring.]—*Flygbl. Växtskyddsanst.* no. 10, 6 pp., 3 figs. Stockholm, 1934. [Recd. August 1935.]

Of the sawflies attacking plum in Sweden, the most important is *Hoplocampa minuta*, Christ, which occurs throughout Götaland and in most of Svealand. The eggs are laid in the blossom or within the sheath of the flower bud. The newly hatched larvae mine in the young fruit. Within 1–2 days of the first attack the fruit is often already destroyed, the inner part being transformed into a black granular mass. The larva then leaves the first fruit and enters a second, larger than the first, and may subsequently enter a third. After 5 or 6 weeks it enters the soil and overwinters in a cocoon. Pupation occurs the following spring and the adults emerge about blossom time. The larvae often attack 75–80 per cent. of the fruit. When within the fruit they cannot be reached by sprays. Such contact poisons as nicotine, pyrethrum and derris sprays, applied before and after blossoming did not destroy the eggs. On the other hand, early blossoming trees sprayed on 8th May with 1 per cent. nicotine gave a good crop with only a very small percentage of infested plums, whereas adjacent unsprayed trees gave a very poor crop, and many of the fallen plums were heavily infested. Plums are also attacked by *H. flava*, L., in south Sweden, *H. brevis*, Klug, in Småland, and *H. rutilicornis*, Klug, in Uppland.

AHLBERG (O.). **Clercks Minerarmal** (*Lyonetia clerckella* **L.**).—*Flygbl. Växtskyddsanst.* no. 11, 6 pp., 3 figs., 1 ref. Stockholm, 1934. [Recd. August 1935.]

Outbreaks of *Lyonetia clerckella*, L., on apple and cherry were reported from various parts of Sweden in 1934. It also attacks plum,

wild species of *Prunus*, hawthorn [*Crataegus*], mountain ash [*Sorbus aucuparia*], birch, etc., but not pear. Brief notes are given on its bionomics and control [*cf. R.A.E.*, A **14** 612]. A spray containing 1 per mille pure nicotine killed 78·4 per cent. of the pupae on heavily infested cherry trees. Pyrethrum and derris preparations in 1 and 2 per cent. sprays killed at most 37 per cent.

MALENOTTI (E.). **La Carruga della vite.** [*Anomala vitis.*]—*Coltivatore* 1935 no. 13 reprint 8 pp. Casale Monferrato, 1935.

Anomala vitis, F., is chiefly a pest in the adult stage, when it feeds on the leaves of fruit trees, willows and other trees as well as grape-vines. In the province of Verona the adults appear in June, return underground in July and die soon afterwards. In irrigated land the life-cycle is completed in a year, but in dry ground larvae that hatch in July do not pupate until June in the second year, the adults emerging after a pupal period of 8–10 days. When the beetles attack trees on the bank of a stream they can be shaken into the water and collected in a net placed downstream. In districts where the grape is almost the only food-plant available, the general application of an arsenical spray should be made compulsory.

FAGNIEZ (C.). **Note sur** *Barbitistes berenguieri* **V. Mayet (Orth. Tettigoniidae).**—*Bull. Soc. ent. Fr.* **40** no. 12 pp. 190–191. Paris, 1935.

Barbitistes berenguieri, Mayet, has been found causing serious damage to the leaves and fruits of young peach trees in Var. Vines growing among the trees were not attacked, and records of this species on vine are probably due to confusion with *Ephippiger*. The author considers that it may prove to be merely a colour variation of *Barbitistes fischeri*, Yersin.

LAVAUDEN (L.). **Sur la présence du grand capricorne (*Cerambyx cerdo* L.) sur le robinier et sur un hyménoptère parasite de ce longicorne.**—*Bull. Soc. ent. Fr.* **40** no. 12 p. 191. Paris, 1935.

Larvae of *Cerambyx cerdo*, L., were found in Isère in an old trunk of *Robinia*, a tree from which the species has not previously been recorded. It usually attacks oak, and its occurrence in *Robinia* was probably due to the fact that all the oak trees in the district were removed during the war. Beside one of the larvae there were at least 20 cocoons of the Braconid, *Doryctes longicaudis*, Giraud.

MALENOTTI (E.). **Un problema di estetica montana : la coleofora del larice.** [A Problem of Mountain Beauty : *Coleophora laricella.*]—*Atti Accad. Verona* (5) **13** pp. 153–158, 6 pls. Verona, 1935.

The decorative value of the larch in Alpine resorts in Italy is much impaired by infestation by *Coleophora laricella*, Hb., which results in a grey and yellowish discolouration of the needles. Such an attack was successfully controlled on larches experimentally sprayed in January 1935 up to a height of about 25–31 ft. with a 5 per cent. tar distillate.

GRAY (R. A. H.) & BROOKS (H. E.). **Spraying Trials against the Raspberry Beetle** (*Byturus tomentosus* **Fab.**).—*J. R. hort. Soc.* **60** pt. 8 pp. 339–341. London, August 1935.

After preliminary trials in 1932 and 1933 with various sprays against *Byturus tomentosus*, F., on raspberries in northern England, dusts and sprays of barium fluosilicate and derris and sprays of nicotine were tested in 1934. The percentages of fruits damaged when two sprays were applied, the first when the buds were opening and the second when the petals were falling, were 11·5, 12·5 and 19 on bushes sprayed with derris, barium fluosilicate and nicotine, respectively, as compared with 41 on the control. The derris spray acted more uniformly than the barium fluosilicate. The addition of a third spray, applied when the buds were fully open, was of no value. When two applications of a derris or barium fluosilicate dust, given when the buds were beginning to open and again when they were fully open, were followed by a spray when the petals were falling, the percentages of damaged fruit were 18 and 21·5, respectively. As the times of appearance of the beetles and of opening of the buds vary from year to year, the first application should always be made when the buds are beginning to open.

NEWTON (H. C. F.). **Insect Pests at Rothamsted and Woburn, 1933–4.** —*Rep. Rothamsted exp. Sta. 1934* pp. 71–73. Harpenden, 1935.

On one field of oats an outbreak of *Heterodera schachtii*, Schm., so retarded growth that attack by frit fly [*Oscinella frit*, L.] was intensified, and in some areas practically no crop was produced. Occasional oat plants were destroyed by Lepidopterous larvae, probably *Trachea* (*Apamea*) *secalis*, L. As many as 20 larvae of *O. frit* were sometimes found on one plant of tillering maize. Although there was an increase in the number of wireworms, *Sitodiplosis mosellana*, Géh., and *Contarinia tritici*, Kby., since the previous year, insects caused no appreciable loss of wheat. The wheat bulb fly [*Hylemyia coarctata*, Fall.] was also present, and *Cephus pygmaeus*, L., was observed ovipositing in early June, but *Agromyza ambigua*, Fall., was rare. Wireworms damaged barley, but the infestation was less on plots on which the four-course and six-course rotations were used. *Phyllotreta vittula*, Redt., and larvae of an unidentified sawfly caused slight damage to the leaves, but attacks of frit fly and gout fly [*Chlorops taeniopus*, Mg.] were not serious.

A general infestation of *Atomaria linearis*, Steph., combined with bad growing conditions, caused some loss of mangels. Springtails were also present. Sugar-beet was not seriously affected by *Chaetocnema* (*Plectroscelus*) *concinna*, Marsh., *A. linearis*, *Pegomyia hyoscyami*, Panz., or springtails. Beans were severely attacked by *Sitona lineata*, L. *Aphthona euphorbiae*, Schr., was not numerous enough on flax to cause damage.

KEARNS (H. G. H.), MARSH (R. W.) & MARTIN (H.). **Combined Washes. Progress Report.**—*Rep. agric. hort. Res. Sta. Bristol 1934* pp. 109–125, 12 refs. Bristol [1935].

Investigations on combined insecticide-fungicide washes were continued at Long Ashton [*cf. R.A.E.*, A **21** 556]. As soap is unsuitable

for use with lead arsenate, lime-sulphur or Bordeaux mixture, an attempt was made to determine the relative efficiency of other spreaders in sprays against the apple sawfly [*Hoplocampa testudinea*, Klug]. The conditions of the experiments rendered the results inconclusive. In further tests post-blossom sprays of 1½ gals. lime-sulphur and 8 oz. nicotine per 100 gals. with the addition of a spreader or oil were applied on 22nd May. With 1 lb. Agral N in the spray, 2·99 per cent. of the fruitlets were infested; with 6 pt. sulphite lye, 3·09 per cent.; and with 1 gal. refined oil emulsified with ½ gal. 20 per cent. sulphite lye, 2·1 per cent. When the lime-sulphur was used alone the infestation was 28·3 per cent. To test the safety of combinations of lime-sulphur and oil, trees of 14 varieties were sprayed at "green flower" stage with 3 per cent. lime-sulphur, and at "early pink" stage 3 per cent. lime-sulphur and 3 per cent. refined petroleum oil (emulsified with sulphite lye) was used on some of them and 3 per cent. lime-sulphur on the rest, except for a few controls. Apart from marginal leaf scorching on 2 varieties sprayed with oil and lime-sulphur, damage was negligible. No damage was caused by post-blossom treatment with sprays containing 1 gal. oil and 1 or 1½ gals. lime-sulphur.

Since the monosulphide in lime-sulphur causes lead arsenate to decompose [*cf.* **14** 596], ferrous sulphate was used to precipitate this agent as an insoluble sulphide [**19** 473]. After application, the precipitated ferrous sulphide became oxidised to ferric oxide, which improved the retention of the sulphur and arsenate deposit, and to free sulphur, which increased the fungicidal efficiency of the wash. To test the extent to which ferrous sulphate reduces the interaction between lead arsenate and lime-sulphur, air was passed through washes containing and not containing the sulphate. When oxidation was completed the amounts of free As_2O_5 liberated were estimated as 9·3 and 233 mg. per litre, respectively. The spray of lime-sulphur, nicotine and Agral N mentioned above gave 2·99 per cent. infested fruitlets when used alone, 8·3 per cent. with the addition of 2 lb. lead arsenate, and 4·67 per cent. with the addition of 2 lb. lead arsenate and 5 lb. ferrous sulphate.

Sprays of various petroleum oils (all at concentrations of 4·25 per cent.) in combination with tar oil at the same concentration or with lime-sulphur, applied in February or in April before the flower buds were open, greatly reduced Capsid infestation on black currants and caused no damage. Of several emulsifiers oleic acid [**19** 612] was the best. The specifications of the oils are tabulated. Semi-refined petroleum oil was as effective an ovicide as the more expensive half-white oil. Sprays of white oil (5 per cent.) emulsified with sulphite lye and lime-sulphur (6 per cent.) reduced infestation from 100 to 10·1 per cent., but marginal leaf scorching occurred and growth was checked.

Trials were made on plum at petal fall with a wash of 2 lb. lead arsenate, 1 gal. lime-sulphur, 8 oz. nicotine and 8 oz. Lethalate per 100 gals. Control of red spider and caterpillar was satisfactory. The foliage was only injured on one variety. In further trials the trees were sprayed a week after petal fall with 2 pints colloidal lead arsenate, 8 oz. nicotine, and 8 oz. Lethalate, and 18 days later with either 1 gal. refined petroleum oil and 4 lb. lead arsenate or with 2 lb. ground derris root containing 2 per cent. crystalline rotenone, 4 lb. lead arsenate and Lethalate. In no case was the control of plum sawfly [*H. flava*, L.] satisfactory, but red spider control was good and no foliage injury occurred.

KEARNS (H. G. H.). **The Control of Insect Pests of Basket Willows, with special Reference to the Use of combined insecticidal and fungicidal Washes and to Methods of Application.**—*Rep. agric. hort. Res. Sta. Bristol 1934* pp. 126–146, 10 refs. Bristol [1935].

General notes are given on the bionomics of insects and fungi that attack basket willows in England, on the properties of insecticides and fungicides used against them, on the value of combined washes, on spreaders, and on the critical stages for control. Formulae for dusts and sprays against the major pests are included, with directions for their preparation and application.

The foliage Aphids, *Aphis saliceti*, Kalt., *Cavariella capreae*, F., and *Pterocomma pilosum*, Buckt., and the stem Aphids, *Lachnus salignus*, Gmel. (*Pterochlorus viminalis*, Boy.), and *Pterocomma* (*Melanoxantherium*) *salicis*, L., occur on *Salix triandra*, *S. purpurea*, *S. alba vitellina* and *S. viminalis* ; *Galerucella lineola*, F., and *Rhabdophaga heterobia*, H. Lw., on *S. triandra* ; *Phyllodecta vitellinae*, L., on *S. purpurea* and *S. alba vitellina* ; and *P. vulgatissima*, L., and the shoot moths, *Depressaria conterminella*, Zell., *Peronea hastiana*, L., and *Cheimatobia brumata*, L., on *S. viminalis*. At bud burst (when soil conditions often prevent the use of spraying equipment) derris dust, alone or in combination with copper sulphate and lime, should be used against adults of *G. lineola*, *P. vitellinae* and *P. vulgatissima*. Sprays are used for subsequent applications ; the quantities of insecticides given are combined with 100 gals. Bordeaux mixture (10 : 10) or (in the August spray) with 100 gals. water. In early to mid-May, 4 lb. lead arsenate, together with 6 oz. nicotine for *R. heterobia* on *S. triandra*, should be used against *G. lineola*, *P. vitellinae*, shoot moths and *P. vulgatissima*. In mid-June, the most important spray stage, 6 oz. nicotine and 2 lb. lead arsenate should be used againt *R. heterobia*, Aphids, eggs and larvae of *G. lineola* and larvae of *P. vitellinae*, *P. vulgatissima* and sawflies. From the middle to the end of July, 6 oz. nicotine should be used against *R. heterobia* and stem Aphids ; and in mid-August, 2 lb. lead arsenate against the second brood larvae of *P. vitellinae* and *P. vulgatissima*. The addition of a wetter is necessary for all sprays applied to willow foliage ; proprietary wetters, consisting of sulphonated compounds of naphthenic and aromatic hydrocarbons, and the sulphonation products of the saturated higher fatty alcohols are recommended.

HUTCHINSON (H. P.) & KEARNS (H. G. H.). **The Control of the Brassy Willow Beetle with special Reference to the Use of Dusts.**—*Rep. agric. hort. Res. Sta. Bristol 1934* pp. 147–149, 2 refs. Bristol [1935].

In further work on the control of *Phyllodecta vitellinae*, L. [*cf. R.A.E.*, A **19** 608], which attacks basket willows, especially *Salix purpurea* and *S. alba vitellina*, in England, beetles collected from a willow bed were placed in lots of 50 in petri dishes and dusted with a proprietary dust of ground derris root and a carrier (crystalline rotenone content 0·18 per cent.). They were immediately afterwards placed in clean dishes and on the following day 98 per cent. were dead. On a block of 35 stools of *S. alba vitellina* dusted on 30th May, 751 dead beetles were counted on the ground next day and only 3 live beetles were found on plants. By introducing insects into a muslin cage over a dusted stool it was found that in dry weather effective toxicity lasts at least 3 days. In another test, a dust of ground derris and kaolin with

the same rotenone content was as effective as the proprietary dust; the experiment with pyrethrum and kaolin [**19** 609] had been thought to indicate that this carrier does not adhere well to the beetles. Dusting should be done when the buds burst and before the shoots attain a length of 18 inches.

Walton (C. L.). **The Control of *Phyllopertha horticola* L. in Grassland.** —*Rep. agric. hort. Res. Sta. Bristol 1934* pp. 150–157, 1 fig., 4 refs. Bristol [1935].

In the autumn of 1933, the larvae of *Anomala* (*Phyllopertha*) *horticola*, L., seriously damaged 2 hay fields in Somerset, especially the slopes, which face south and south-east, and they lightly infested a higher and fairly level field in the following year. Most of the grass on 8–9 acres was destroyed, and there were about a million larvae per acre in the more severely infested parts. The adults of this Rutelid (the characters of which are described) appear about mid-June and feed on dock, clover, bracken tips, etc. They lay their eggs in grassland, and the larvae feed on the roots for about 8 months and then pupate. Previous control experiments are discussed [*cf. R.A.E.*, A **22** 460]. On 9th and 10th October 1933, a top dressing of 2 cwt. crude naphthalene per acre applied to the lower fields killed many larvae, so that in November there were only about 174,240 per acre, and about 6,500 pupae per acre in May 1934. Comparative experiments in 1934 showed that adults preferred hay grass to closely grazed land and did not oviposit on land mown at the time of flight. The use of 25 and 56 lb. per acre of flowers of sulphur as a surface dressing to deter oviposition yielded inconclusive results.

Bodenheimer (F. S.). **Studies on the Zoogeography and Ecology of palaearctic Coccidae I–III.**—*Eos* **10** (1934) no. 3–4 pp. 237–271, 4 figs., 10 refs. Madrid, 10th June 1935.

The first section of this paper comprises an outline of the distribution of Coccids in the south-east of the Palaearctic region, with reference to the geography and history of their origin, and includes an annotated list of the 113 Palestinian species. The second section deals with the food-plants of Coccids. The author divides them into genuine hosts, on which a normal development during the whole life-cycle takes place; tolerated hosts, on which there is considerable nutritional mortality; partial hosts, which are unsuitable for the young larvae; and unsuitable hosts, which preclude any development. For *Icerya purchasi*, Mask., *Citrus* is a genuine host, *Spartium junceum* a tolerated one, and potato belongs either to the third or fourth group. From a comparison of the fauna of introduced and native plants, it is concluded that introduced plants that have no closely related species in the indigenous flora are not suitable hosts for native species of Coccids. The third section treats of life-history and ecology. Diapause and body temperature are discussed, and a general outline is given of the life-history of Palestinian Coccids.

Bolívar y Pieltain (C.). **Estudio monográfico de las especies españolas del género *Anastatus* Motsch. (Hym. Chalc.).** [A monographic Study of the Spanish Species of *Anastatus*.]—*Eos* **10** (1934) no. 3–4 pp. 273–292, 10 figs. Madrid, 10th June 1935.

A key is given to the four Spanish species of *Anastatus* and both sexes of the adults of *A. catalonicus*, sp. n., *A. bifasciatus*, Boy., and *A.*

disparis, Ruschka, and the adult female of *A. dolichopterus*, sp. n., are described. Both the new species were taken on oak, but the hosts are unknown.

Pieri (A.). **La infestione di *Cydia molesta* nella corrente campagna in Toscana.** [Infestation by *C. molesta* in the current Season in Tuscany.]—*Note Fruttic.* **13** no. 8 pp. 129–131. Pistoia, August 1935.

In some parts of Tuscany during 1935 infestation of peach shoots by *Cydia molesta*, Busck, began later and was very much lower in June and July than in previous years. As control measures had never been applied in these districts and the presence of parasites imported from abroad was most unlikely, no explanation has been found, especially as a similar decrease was reported from Liguria, where the climate is very different.

Bramard (A.). **L'influence prépondérante de certains facteurs météorologiques sur l'invasion récente du doryphore dans le Centre.**—*Rev. sci. Bourbon.* 1935 no. 1–2 pp. 26–31. Moulins, 1935.

A sudden invasion of the greater part of central France by the potato beetle, *Leptinotarsa decemlineata*, Say, in June 1935 is believed to have been due chiefly to climatic factors, heat, rising and circling air-currents and cyclonic storms.

Poutiers (R.). **Le bupreste du pêcher** (*Capnodis tenebrionis*).—*Bull. Soc. linn. Provence* **6–7** (1932–33) pp. 55–56. Marseilles, 1934. [Recd. October 1935.]

The bionomics of *Capnodis tenebrionis*, L., in stone-fruit trees in southern France are briefly outlined [*cf. R.A.E.*, A **22** 714, etc.]. The adults should be collected and destroyed in the early morning before they become active, and trees that are attacked should be dug up and burned, immune varieties being planted in their place. Insecticides and repellents have been tried with varying success.

Fári (L.). **Beiträge zur Lebensweise und Bekämpfung der Apfelwickler** (*Carpocapsa pomonella* **L.**) **in Ungarn.** [Contributions to the Biology and Control of *Cydia pomonella* in Hungary.] [*In Magyar.*]—*Borász. Lapok* 16, 32 pp., 8 pls., 24 refs. Budapest, 1935. (With a Summary in German.)

In some localities in the Hungarian lowlands infestation by *Cydia* (*Carpocapsa*) *pomonella*, L., almost prevents the growing of winter apples. In 1934 an abnormally early and warm spring caused the first moths to appear on 26th April, 6 days after blossoming. A few of the first and most of the second generation larvae hibernated, but the long, warm summer resulted in the production of a partial third generation, which is exceptional in Hungary. Most of the larvae of this generation were removed in the harvested apples. In experiments, the results of which are tabulated, sprayed trees produced 75·1 per cent. sound fruit and unsprayed trees 20·6. As only 18·4 per cent. of the first generation larvae entered the fruit through the calyx, later sprays are more useful. Supplementary measures are suggested and a schedule for spraying is given.

[Zolotarev (E. Kh.).] **Золотарев (Е. Х.). Note sur la répartition géographique de l'*Acridomyia sacharovi* Stack., parasite de la *Locusta migratoria*.** [*In Russian.*]—*Arch. Mus. zool. Univ. Moscou* **1** pp. 155–156, 5 refs. Moscow, 1934. (With a Summary in French.) [Recd. August 1935.]

Acridomyia sacharovi, Stack., a Dipterous parasite of *Locusta migratoria*, L., previously recorded only from the Aralo-Caspian area, has been found by the author in the Kuban, North Caucasus.

Insect Pests and their Control.—*Agric. Gaz. N.S.W.* **46** pt. 7 pp. 394–398, 5 figs. Sydney, 1st July 1935.

This part of a series on insect pests in New South Wales [*cf. R.A.E.*, A **23** 560] includes notes on *Eriophyes pyri*, Pgst., which is widely distributed and damages the leaves and young fruits of pear. The mites overwinter beneath the bud scales. Development from egg to adult takes 2–4 weeks, and the generations overlap. Spraying with lime-sulphur (1 in 10) when nearly all the leaves have fallen or when the buds begin to swell is effective. *Aspidiotus perniciosus*, Comst., which attacks apples, pears, quinces, and, less frequently, stone fruits may be controlled by miscible red oil (1 : 20) or lime-sulphur at winter strength. In most apple orchards, *Eriosoma lanigerum*, Hsm., is usually kept under control by *Aphelinus mali*, Hald., but if sprays are needed, miscible red oil (1 : 20) applied in winter at high pressure and short range controls the Aphid without harming its parasite. Psocids infesting books, carpets, rattan furniture, etc., may be controlled by exposing the articles to sunlight or heating the room to 120–140°F. for several hours ; but if infestation is severe, it may be necessary to fumigate with hydrocyanic acid gas or sulphur.

Summerville (W. A. T.). **White Louse of Citrus.**—*Qd agric. J.* **44** pt. 1 pp. 4–8, 2 pls. Brisbane, July 1935.

Prontaspis (*Chionaspis*) *citri*, Comst., attacks *Citrus* throughout Queensland, especially in dry areas, but is only important in neglected orchards. The appearance of the scales of both sexes (of which the males are more numerous) is briefly described. The larvae usually settle on the trunk and main limbs of the tree, and infestation causes the bark to harden and crack, so that gumming often ensues. These crevices give entry to borers and other pests. The fruit, twigs and leaves of unhealthy trees are also attacked. The offspring of any one female may emerge over 3–6 weeks, and as the females complete their development in about 65 days, there is no well-defined succession of generations. Despite continuous breeding the numbers are greatly reduced in winter. Before control is attempted the orchards should be inspected to see what stage or stages are present, for one stage may predominate in any orchard at a given time, and to determine the occurrence of natural enemies. These include the predacious larvae of *Catoblemma dubia*, Butl., which are usually numerous towards the end of the summer, and small parasitic Chalcidoids. Lime-sulphur (1 in 12) just before blossom time (late July) or fumigation with hydrocyanic acid gas gives excellent results [*cf. R.A.E.*, A **22** 477]. A mixture of resin, sodium hydroxide and fish oil [*cf.* **22** 712] applied in the cooler months is also effective.

L[EVER] (R. J. A. W.). **Local Derris Root as a possible Export for Insecticidal Use.**—*Brit. Solomon Is. agric. Gaz.* **3** no. 2 pp. 5–6. Tulagi, April 1935.

In order to test the possibility of growing derris for export [*cf. R.A.E.*, A **22** 525], specimens of roots, stems and leaves of *Derris* (*Deguelia*) *trifoliata* from various parts of the Solomon Islands were sent to the Rothamsted Experimental Station. In tests made there with alcohol extracts against *Aphis rumicis*, L., the Malayan species (*Derris elliptica*) was twenty times as toxic as the best sample of *D. trifoliata*.

LEVER (R. J. A. W.). **The Green Coconut Bug,** *Amblypelta cocophaga* **China.**—*Brit. Solomon Is. agric. Gaz.* **3** no. 2 pp. 6–7, 6 figs., 1 ref. Tulagi, April 1935.

Notes are given on *Amblypelta cocophaga*, China [*cf. R.A.E.*, A **22** 490], a pest of coconut in the Solomon Islands, where it sucks the sap and causes immature nutfall. Its distribution in the Islands is very irregular. From eggs laid on the bracts of saplings of *Macaranga tanarius*, a common food-plant, some parasites, probably *Anastatus axiagasti*, Ferrière [*cf.* **22** 524, etc.], were bred.

JEPSON (W. F.) & EVANS (H.). **Un essai préliminaire sur la résistance des variétés de cannes à l'attaque du** *Phytalus*.—*Rev. agric. Maurice* no. 81 pp. 97–101. Port Louis, 1935.

The results of experiments in Mauritius with varieties of sugar-cane in relation to their tolerance or resistance to attack by *Lachnosterna* (*Phytalus*) *smithi*, Arrow, are shown in a table. The technique of the experiments and the method of measuring resistance and tolerance are described. The weather was excessively dry, and the stems were heavily infested by *Diatraea venosata*, Wlk., and *Eucosma* (*Grapholitha*) *schistaceana*, Sn. Uba and P.O.T. 2878 were so resistant to *Lachnosterna* that they gave practically the same results in the experimental rows as in the controls. The latter is very suitable for humid areas below 750 ft. altitude. A tolerant cross of these two varieties (M.104/30), although it was very heavily infested, yielded twice as much as the best of the other varieties (D. 1135) in the controls. Infestation by *Lachnosterna* does not decrease the number of shoots, but robs them of their vigour, with the result that they suffer badly from borers.

COWLAND (J. W.). **Gezira Entomological Section, G.A.R.S. Report on experimental Work, 1933–34.**—*Rep. Gezira agric. Res. Serv. Sudan Govt 1934* pp. 99–118, 2 graphs. [Wad Medani, 1935.]

Extensive breeding of *Bemisia gossypiperda*, Misra & Lamba, on *Ipomoea cordofana* was recorded at the end of July in the Sennar district of the Sudan. There is evidence that adults that appeared on *I. cordofana* and other plants maturing later in areas north of this district at the beginning of August had migrated from these breeding grounds. On lubia (*Dolichos lablab*) sown during May and June, the Aleurodid was not numerous until the rains set in [*cf. R.A.E.*, A **22** 681]. To obtain records of infestation on cotton that could be compared from year to year, the nymphs found within a central area of 10 sq. cm. on each of 100 leaves of about 3 weeks' growth were counted

weekly in 5 localities throughout the season and classified as healthy, parasitised or dead. This way of counting made it possible to estimate the number of nymphs belonging to a single generation. An analysis of the data shows that Aleurodids emerged in large numbers from early to middle October in all localities and that two further large generations occurred during the middle of November and middle of December in two localities. Cotton sown on 7th August was more heavily infested than cotton sown on 5th September, but the infestation fell off sooner. The rapid decrease was due to the increasing number of nymphs of all stages drying up from causes that appear to be connected with temperature and humidity and age of the plant. These deaths began in the middle of October, when humidity dropped though temperature remained high, and rapidly became more numerous until the end of December. In parasite cages, where batches of 200 leaves collected fortnightly from various localities were kept, large numbers of *Eretmocerus diversiciliatus*, Silv., emerged in January, but parasites did not exert an effective check. The increase in the number of parasites is much more marked on *D. lablab* than on cotton. Only one of several attempts to transmit leaf-curl by caging one or two infective Aleurodids in small glass tubes on single apical leaves of cotton seedlings was successful ; in this experiment two individuals were fed on fully developed leaves after the plant had been cut back. The disease did not seem to be more virulent when successive fresh lots of infective Aleurodids were caused to feed on the plants than when only one lot fed continuously. The results of experiments in leaf-curl transmission by means of grafting among 4 strains of cotton resistant or susceptible to leaf-curl are shown. In main crop sakel [*Gossypium peruvianum* × *barbadense*], the percentages of infected plants were 29 on 2nd November and 92 on 11th December in 1932 whereas in 1933 on two plots they were only 0·6 and 0·2 on 11th November and 9·6 and 8·4, respectively, on 24th December. A number of new strains and types of cotton continued to be far more resistant to leaf curl at all stages of development than the Gezira main crop [*loc. cit.*]. The effect of manuring varies with the strains and date of sowing, but in many cases unmanured plants show less infection.

No individuals of *Hercothrips fumipennis*, Bagn. & Cam., or *H. sudanensis*, Bagn. & Cam., were caught in traps placed on the area of last season's cotton. Counts from samples of cotton leaves made at fortnightly intervals in October, November and December showed that the peak of infestation by *Hercothrips* was reached in mid-November and then fell rapidly, the heaviest infestation occurring with one exception in cotton sown latest (6th September). Infestation was greater on widely spaced cotton, and, usually, on plots that had received nitrogen. In a test, infestation was greatest at the end of November on plots that had been lightly watered. The effect of heavy watering is considerable, since where watering is done every 14 days, light watering allows intervening periods long enough for the larvae to pupate and for the adults to emerge.

The percentage of bolls damaged in 1934 by *Platyedra gossypiella*, Saund., was much higher than for the past 5 years and reached 50 per cent. on the Gezira Research Farm at the end of February. The suggested causes are that cultivators stored larger quantities of seed cotton after a period of low market prices, and that as the moths began to emerge later and continued to emerge longer than in previous seasons, more of them found plants sufficiently advanced for oviposition and

infestation was consequently higher in all stages of the crop. Tables for 1929, 1930 and 1933 showing rainfall and emergence of moths over weekly periods from 10,000 bolls containing resting larvae provide evidence for this theory.

It is not yet known whether there is a generation of *Heliothis obsoleta*, F., on weeds before the one on cotton, but the larvae appeared in small numbers on berseem [lucerne] in August, and a few were found on fruits of *Ipomoea cordofana* on 26th September. Of two broods that occurred on cotton in September and October, the second was larger and more injurious. A subsequent brood in November migrated to lubia, where a final brood was produced in December and January and began to decrease rapidly in February. The rest of the year until August is spent in the pupal stage in the ground. According to a survey in late October, *H. obsoleta* was fairly evenly distributed through the Gezira but was slightly more numerous in the west and south. Some of the larvae of each generation, instead of completing the pupal stage in 10–20 days, burrow deeper in the soil and construct earthen cocoons, in which they rest as pupae until the following rainy season. Long-cycle pupae, the percentage of which increases from generation to generation, have been found in both old cotton and old lubia land. *Sturmia inconspicua*, Mg., a Tachinid parasite of the more mature larvae, makes its influence felt only when the host population drops at the end of the season because of the increase in the number of long-cycle pupae. According to fortnightly records, the percentage of parasitism increases from 4 on 15th October to 53 on 15th February ; it drops from 12 on 30th November to 5 on 15th December because the hosts migrate to lubia and many of the parasites fail to follow them. No eggs or larvae of *H. obsoleta* were found on maize grown as a trap-crop round a small plot of cotton. Records from 5 localities for 3 sowing dates show that 16 and 25 per cent. of the two smaller sizes of bolls that were shed were infested by *H. obsoleta*, whereas among the two larger sizes only 10 and 7 per cent. were infested. Where the percentage of shed bolls that were infested was lowest, the average yield was lowest, and where that percentage was highest, the yield was also highest. High shedding of fruiting organs was accompanied by heavy leaf shedding. The date of sowing affects both the initial and subsequent infestation of cotton by *H. obsoleta*, the earliest sown crop being the most heavily infested by both broods.

Owing to the absence of weed-growth until the heavy rains towards the end of August, the Pentatomid, *Agonoscelis versicolor*, F., was exterminated over the whole of the central area and on the northern fringes of the southern area of the Gezira.

Félix (J.). **Acridiens nuisibles dans la région côtière de la Guinée française.**—*Agron. colon.* no 212 pp. 33–44, 3 figs., 5 refs. Paris, August 1935.

The annual life-cycle and migrations of *Locusta migratoria migratorioides*, R. & F., in French Guinea are discussed [*cf. R.A.E.*, A **22** 703]. It damages graminaceous crops, pineapple, coconut, oil palm (*Elaeis*) and *Borassus*, and has reduced the banana crop by an average of 2,000 tons annually since 1931 in Kindia district. Smoke screens are recommended against the swarms, and poisoned baits against hoppers and adults. *Schistocerca gregaria*, Forsk., occurs only exceptionally, and is usually mixed with *Locusta* [*cf.* **19** 684 ; **22** 703].

Zonocerus variegatus, L., which is an indigenous species, damages cassava [*Manihot utilissima*], *Ageratum mexicanum*, *Citrus*, coffee, coconut, bread fruit [*Artocarpus incisa*], vegetables, and particularly bananas, both the leaves and the fruit of which are eaten. It has one generation a year and oviposits in June–July, usually in the lowlands, where the cultivated fields are subsequently invaded by bands of hoppers. Measures for control include adhesive bands or zinc funnels to prevent the hoppers from climbing the trunks of trees, oil emulsion against the young hoppers, and a spray of sodium arsenite (5 lb. per 100 gals.), although it scorches plants, against the older ones. Banana groves should be sprayed with lead arsenate (8 lb. per 100 gals.) every 4 or 5 days. Another indigenous species damaging banana is *Catantops notatus*, Karsch., which has one generation a year, hibernating in the egg or larval stages, and can also be controlled by lead arsenate sprays.

Uvarov (B. P.). **The Locust Outbreak in Africa and western Asia in 1934.**—*Econ. adv. Coun. Comm. Locust Contr.* 65 pp., 11 maps. London, H.M.S.O., 63–80–4, 1935. Price 3*s*.

In continuation of the similar survey for 1933 [*R.A.E.*, A **22** 701], the breeding and migrations in 1934 of *Schistocerca gregaria*, Forsk., *Locusta migratoria migratorioides*, R. & F., and *Nomadacris septemfasciata*, Serv., are discussed in detail and illustrated by a series of maps.

The invasion by *Schistocerca* during 1934 was light, and the outbreak had terminated by early 1935 in the Moroccan-Senegambian and Algerian-Nigerian areas and in eastern Africa, Arabia and India. Incipient swarms appeared in South Africa and along the Sudanese Red Sea coast, where two successive generations bred in the winter 1934–35. A close watch should be kept on these areas and on the solitary locusts and loose swarms in India. Data collected in 1934 confirm the theory that swarms that do not migrate north in the winter hibernate in the summer areas and breed again only in the following year, and that migration northward and the production there of a second spring brood occurs only when larger swarms are present. The movements of swarms in the summer areas from west to east suggest that there are original outbreak areas near the Atlantic coast of Mauretania, but this requires investigation.

Valuable data, which throw light on the sequence of generations of *Locusta migratoria migratorioides* and their seasonal migrations in western Africa, have been contributed by the 1934 survey. The intensity of the outbreak decreased in eastern Africa, from the Anglo-Egyptian Sudan down to Southern Rhodesia, but in western Africa it had increased by the time of the 14th generation. In central Africa, swarms of this generation were more numerous than those of the 13th, and incipient swarms appeared in Cape Province, South Africa. It is concluded that the present outbreak may continue for some time and that the further outlook is uncertain.

The pessimistic forecast made about *Nomadacris* in the 1933 survey was justified in 1934. The infested area expanded in all directions, but particularly southwards. Breeding occurred for the first time in Kenya and Uganda, and in the extreme north-west of the invaded area swarms entered Moyen Congo and Gabon. The limit in the south has been reached, but the infestation may spread farther north in the Belgian Congo and Uganda. The development of an epidemic of the fungus, *Empusa grylli*, which greatly reduced the size

and number of the swarms of the 8th generation, somewhat relieved the situation. The peak of the outbreak was reached in 1934, but it is probable that it will continue for at least a year or two. The primary factors affecting great migrations of *Nomadacris* are seasonal meteorological changes over wide areas. As a general rule only one generation a year is produced, but there is extreme variation in the breeding season and in the length of the development period.

An appendix contains a bibliography of papers dealing with the locust and grasshopper problem, continuing and supplementing those published in the previous surveys.

Woo (F. C.) & Cheng (T. S.). **A general Investigation of the Locust Outbreaks in China during the Year 1934.** [*In Chinese.*]—*Spec. Publ. nat. agric. Res. Bur. China* no. 10, 32 pp., 5 figs. Nanking, China, Min. Industr., July 1935. Price $0·50. (With a Summary in English.)

In 1934 the outbreak of *Locusta migratoria*, L., was less severe than in 1933 [*cf. R.A.E.*, A **23** 46]. It occurred chiefly in northern China, and bred mainly on the coasts of the Yellow Sea and the banks of rivers and lakes overgrown with the reed, *Phragmites communis*. The bamboo locust, *Ceracris kiangsu*, Tsai, was confined to Hunan Province, where for the last two years it has caused serious damage to cereals, palm trees and particularly bamboo. A map shows the distribution of both species in China in 1934.

Hutson (J. C.). **The Spotted Locust** (*Aularches miliaris*).—*Trop. Agriculturist* **85** no. 2 pp. 127–129, 1 pl. Peradeniya, August 1935.

Notes are given on the bionomics and control of *Aularches miliaris*, L., in Ceylon [*cf. R.A.E.*, A **14** 234; **17** 53]. It oviposits in October–December, and the eggs remain 4 months in the ground. The hoppers hatch in February–April and reach the adult stage in July–September after passing through 6 instars.

King (C. B. R.). **Report of the Entomologist for the Year 1934.**—*Bull. Tea Res. Inst. Ceylon* no. 12 pp. 26–31. Kandy [1935]; also in *Rep. Bd Tea Res. Inst. Ceylon 1934* pp. 26–31. (*Ceylon sess. Paper* 19–1935.) Colombo, 1935.

Pests of tea in Ceylon in 1934 included: *Psyche albipes*, Moore, and *Chalia doubledayi*, Westw., which were present between June and August; *Agrotis ypsilon*, Hfn., against which a bait of Paris green is recommended; *Prodenia litura*, F., the larvae of which were reported to have first fed on *Oxalis*; *Piesmopoda rufimarginella*, Hmpsn., the larvae of which were parasitised by 2 unidentified Braconids; adults of *Microtrichia* (*Lachnosterna*) *costata*, Wlk., which were recorded for the first time on tea; *Saissetia coffeae*, Wlk. (*hemisphaerica*, Targ.), which became rather widespread in one locality towards the end of the year but was checked by a fungus (*Cephalosporium* sp.); *Oscinis theae*, Big., the larvae of which mine beneath the epidermis of the leaves giving them a silvery-grey appearance; and the Trypetid, *Adrama austeni*, Hendel, which was recorded from one locality damaging the exposed seed in a germinating bed. Tests of sprays and dusts containing

sulphur against *Tarsonemus translucens*, Green, suggested that a spray is preferable for untipped bushes and a dust for tea in plucking. A list is given of pests of green manure plants, and tables show the number of outbreaks of nettle grubs [Limacodids] and the acreage affected during the last 4 years and during each month in 1934, when there was an increase in infestation.

RAU (S. Ananda). **A new Pest of Tea in South India.** *Ereboenis saturata* **gen. et sp. nov.**—*Plant. Chron.* **30** no. 2 pp. 28–30. Madras, 26th January 1935.

Between 1932 and 1934 tea plantations in Travancore and Vandiperiyar, South India, were damaged by the larvae of *Ereboenis saturata*, Meyr. [*R.A.E.*, A **23** 253], this being the only Pyralid that has been found on tea. All stages are briefly described. The eggs were laid in small batches on the leaves. The larvae generally fed from the upper surface and left only the lower epidermis. All the leaves on 2 or 3 adjoining branches may be attacked. These skeletonised leaves were webbed together by silken threads, and turned brown. Inside the webs the larvae fed gregariously and pupated. The pre-pupal stage lasted 2 days and the pupal 14. Infestation was confined to patches of leaves, for the gregarious and sluggish habits of the caterpillars prohibit rapid spread. They may therefore be controlled by removing and burning infested branches. A spider, commonly found in the webbed masses of leaves, probably attacks the larvae, and the worm, *Agamermis paradecaudata*, Steiner, parasitises a few individuals.

Entomology.—*Rep. Dep. Agric. Punjab 1933–34* pp. 48–56. Lahore, 1935.

Work on insect pests in the Punjab during the year ending June 1934 is reviewed. The cotton whitefly [*Bemisia gossypiperda*, Misra & Lamba] develops most actively from May to September. In September it migrates from cotton to such alternative food-plants as potato, cultivated crucifers, and various weeds, on which it overwinters. From March to May it attacks cultivated cucurbits and ratoon cotton, and then establishes itself on new cotton. In irrigation experiments the attack was in inverse proportion to the quantity of water supplied to the crop. Plants treated with nitrogenous manures showed comparatively lower infestation, and the percentage of shed and defective bolls was lowest in plants manured with sodium nitrate and ammonium sulphate. A single application of a resin soap spray in July gave a greater yield than 1 application in August and almost as good a yield as 2 applications, in July and August respectively.

Differences in the infestation by the pink bollworm [*Platyedra gossypiella*, Saund.] in various parts of the Punjab have been found to be primarily due to differences in temperature acting on both pupae and adults. The mean temperature in the most important cotton-growing areas is 33°C. [91·4°F.], and pupae exposed to this or a higher temperature tend to produce sterile males. Low atmospheric humidity reduced the number of eggs. Hot dry weather during July–October increases sterility in males, reduces oviposition in females, delays the emergence of long-cycle moths and so reduces the number of broods by one, and increases mortality among eggs and pupae.

Pests of sugar-cane included *Macropes excavatus*, Dist., of which 3 broods were observed in the laboratory but only 2 in the field. As sugar-cane is the only food-plant, this Lygaeid may be controlled by avoiding ratoon.

Monro (H. A. U.). **Observations on the Habits of an introduced Pine Sawfly, *Diprion simile* Htg.**—*Canad. Ent.* **67** no. 7 pp. 137–140, 3 refs. Orillia, July 1935.

Diprion similis, Htg., was recorded for the first time in Canada in Ontario in 1931, and larvae were observed on *Pinus mugo* (*montana*) in Montreal in August 1933. In preliminary observations during 1934 the overwintered larvae were found to pupate in mid-May, and adults were on the wing in late May and early June. The eggs of the first generation hatched in 10–14 days, and the larvae spun cocoons in the second or third week in July. The adults emerged after 11–16 days. The eggs of the second generation hatched in 7–8 days, but the period of larval development was lengthened by the low night temperatures during August, and most of the larvae did not spin their cocoons until mid-September. Some larvae pupated at irregular intervals throughout the season, and some may probably remain in their cocoons for one, two or three seasons. In the Montreal area, however, there seemed to be two well-defined generations. The infestation in 1934 was confined to two areas, but all species of pine commonly grown in Quebec are liable to attack. In experiments, *Pinus mugo P. sylvestris, P. banksiana, P. resinosa* and *P. strobus* were readily selected for oviposition, but *P. strobus* was preferred. In a plantation where overwintering cocoons were observed on *P. strobus* and *P. sylvestris*, most of them were either on the branches or on the needles. The severe winter of 1933–34 apparently destroyed all the cocoons formed on the branches of the trees, but enough of those on the ground and on the lower 3 ft. of the trunks survived to re-establish the infestation. A few of the summer cocoons were constructed on trees other than pine, low-lying shrubs and blades of grass. On the branches of the trees the cocoons were usually clustered at the bases of the smaller twigs. Those on the trunks were either in crevices of the bark or in the scars left by fallen branches.

Gilbert (H. A.). **The Occurrence of two Species of Cecidomyids on Meadow Foxtail (*Alopecurus pratensis* L.) hitherto unreported in Canada.**—*Canad. Ent.* **67** no. 7 pp. 154–156, 7 figs. Orillia, July 1935.

This is a progress report of a survey made in the spring of 1934 of the occurrence of Cecidomyiids on meadow foxtail grass (*Alopecurus pratensis*) in Canada in order to find uninfested areas for producing seed. Of the three important European species [*cf. R.A.E.*, A **18** 501], *Dasyneura alopecuri*, Reut., was found in Ontario and New Brunswick and *Stenodiplosis geniculati*, Reut., in Ontario. The characters distinguishing the adults of these two species are given. No males of either were taken in the field.

D. alopecuri was ovipositing on foxtail grass near Ottawa on 26th May and in New Brunswick on 13th June, and one of each sex was

reared from samples. The eggs are laid singly on the inside of the inner glumes. The larva works its way down to the ovary and when mature can usually be found in a characteristic position with its head next to the base of the seed. The larvae overwinter within the florets wherever they may fall. This species appeared to be the more abundant in the Ottawa district, as many as 80 per cent. of the florets in some heads of grass containing larvae. *S. geniculati* has two generations a year, but adults of the overwintering generation have not been observed. Two females of the first generation emerged about 22nd June from foxtail heads at Guelph. Pupae were obtained at Ottawa as early as 11th June, and on 20th June empty pupal cases were seen protruding from the ends of the florets. It seems improbable that a second generation of this species would establish itself in the stand of foxtail from which the first generation had emerged, as the seeds were well-formed at the time of emergence and the first instar larvae would have difficulty in penetrating the well-developed seed coat. This hypothesis is supported by the failure to find larvae in heads examined after 20th June. In Europe *S. geniculati* is also found on *Alopecurus geniculatus*, and it is possible that a second (overwintering) generation may be found on this grass in Canada.

It is possible that the third of the European species, *Contarinia merceri*, Barnes, may also occur in Canada. Its larvae occur together in the florets, whereas those of the other two species usually occur singly. Many blind florets were found in Ottawa, and florets from heads picked in early June contained clusters of 2–12 eggs or several larvae too small to identify. They could not be found after 11th June.

CARTER (W.) & SCHMIDT (C. T.). **Mass Action Phenomena in Mealybug Wilt.**—*Ann. ent. Soc. Amer.* **28** no. 3 pp. 396–403, 2 figs. Columbus, Ohio, September 1935.

Experiments have been made in Hawaii to test two alternative hypotheses on the incidence of pineapple wilt caused by *Pseudococcus brevipes*, Ckll. The first is that all the mealybugs from a colony are equally toxic and that the number of wilted plants depends on the extent to which a given colony is toxic and a given plant susceptible. The second is that only some individuals in a colony are toxic and the number of wilted plants depends on the incidence of toxic individuals. To test the second hypothesis large amounts of material were obviously required, and over 3,000 plants were therefore infested with from 1 to 40 insects each, and 3,000 plants were kept as controls. It is apparently impossible to make a clear separation by statistical methods between the phenomena of mass action and those of incidence of toxic individuals, and in fact the analysis of the results did not produce curves corresponding to the theoretical curves for mass incidence. Nevertheless, the numbers of infections in the infested plots in which 5, 10, 20 and 40 insects were placed on each plant were greater when more insects were used, and it was also found that there was no significant statistical difference between the controls and plants infested with only one mealybug. This evidence is enough for a preliminary acceptance of the hypothesis that the extent of wilt depends on mass action, particularly as the fact that *P. brevipes* is a parthenogenetic and sedentary species creates a presumption against the alternative hypothesis.

MacAloney (H. J.) & Hosley (N. W.). **Experiments in simplified Control of Mound-building Ants in the Forest.**—*J. For.* **32** no. 9 pp. 1003–1006. Washington, D.C., December 1934. [Recd. October 1935.]

Many young conifers in parts of the north-eastern United States are destroyed by *Formica exsectoides*, Forel. The way in which the trees are killed was studied by Peirson [*R.A.E.*, A **11** 201], who recommended pouring 1 to 1½ lb. carbon bisulphide into a depression in the top of the nest, covering the hole with an inverted vessel, and covering the rest of the mound with sod or earth. This method proved satisfactory on small and medium-sized mounds, but a simpler one is required where the mounds are large (8–10 ft. in diameter) or numerous. In the authors' experiments in Massachusetts, neither paradichlorobenzene nor granular calcium cyanide was effective. Thallium sulphate as a base for baits was not advisable because of the expense of covering it to comply with the law. A modification of Peirson's method, in which damp leaf mould and moss covered with burlap and dosages of 1¼, 1½ and 1¾ lb. chemically pure carbon bisulphide were used, was satisfactory. Although the ignition of the carbon bisulphide after it had been poured into the holes killed the ants quickly by causing sulphur dioxide to be liberated, there is considerable danger of fire. Ethylene dichloride is almost as volatile as carbon bisulphide, but is not inflammable and is less dangerous to the operator. The best way to kill the ants was to remove several inches of the top material, to punch a hole in the centre and others round the periphery, and after pouring ethylene dichloride or carbon bisulphide in the holes, to tamp the top material in firmly. The amount of liquid required was 1 lb. when the diameter of the mound was less than 1½ ft. and 2 lb. when it was less than 2½ ft. A larger mound may need two or more applications of 2 lb. each. In comparative tests, ethylene dichloride did not work quite so well as carbon bisulphide. A cheap commercial carbon bisulphide was completely effective.

The best time to fumigate is in late autumn or early spring, because all the ants are then in the mound. The best time in summer is during a period of high humidity and low atmospheric pressure, when most of the ants are in the mound and the gas will remain longer in the tunnels.

Salman (K. A). **Entomological Factors affect Salvaging of Fire injured Trees.**—*J. For.* **32** no. 9 pp. 1016–1017. Washington, D.C., December 1934. [Recd. October 1935.]

In California *Pinus ponderosa* that has been damaged by fire is severely injured by insects, particularly *Dendroctonus brevicomis*, Lec. Mortality is greatest in the first and second years after the fire. Trees that have been completely defoliated and have lost most of their buds die even if they are not attacked by insects. Trees with 50–75 per cent. defoliation and with moderate or heavy cambium injury, and trees with 75–100 per cent. defoliation usually succumb to insect attack, and should be salvaged. Unless injury by fire has been slight, trees with 50–75 per cent. defoliation and little cambium injury, and trees with 25–50 per cent. defoliation and moderate to heavy cambium injury should not be cut down.

COUCH (J. N.). *Septobasidium* **in the United States.**—*J. Elisha Mitchell sci. Soc.* **51** no. 1 pp. 1–78, 44 pls. Chapel Hill, N.C., August 1935.

This paper on species of the genus *Septobasidium* and the trees they attack in the United States includes a list of 19 species of Coccids that have been found in symbiotic association with these fungi.

MAIL (G. A.). **Cold Weather and its Effect on injurious Insects.**—*Circ. Montana agric. Exp. Sta.* no. 146, 8 pp., 3 figs. Bozeman, Mont., March 1935. [Recd. August 1935.]

This is a popular account of the manner in which insects pass the winter, with particular reference to the commoner sorts of injurious insects in Montana. A diagram shows the degree of protection afforded to different types of hibernating insects by snow covering when the air temperature is −25°F. Cold weather sufficiently severe and prolonged is too rare to be relied on for controlling pests.

BORDEN (A. D.). **The Willow Weevil as a deciduous Fruit Insect Pest.**—*J. econ. Ent.* **28** no. 4 pp. 661–665, 3 figs., 2 refs. Geneva, N.Y., August 1935.

Stamoderes (*Mimetes*) *uniformis*, Casey, a native pest of willow in California, has established itself in deciduous fruit orchards during the past 10 years [*cf. R.A.E.*, A **18** 710], and in several places more than half the crop has been lost. Until 1928 the injury was attributed to *Hemerocampa vetusta*, Boisd. Infestation was started by the practice of supporting fruit trees with props cut from riverside willows in early summer when adults and egg masses were abundant. The weevils do not fly, and willow near infested orchards has not been found to be attacked. In orchards, apple is the preferred food-plant, but peach, pear, cherry and prune are also attacked. The adults emerge from the ground below the tree in March and April. They feed on the tips of folded buds, on the blossoms and newly-formed fruit. The eggs are laid in masses of about 25 on the lower surfaces of the leaves from the end of April until the middle of June, when all the adults disappear. The larvae hatch in 18–21 days and drop to the soil, where they feed on the roots until they enter the pupal stage, in which they pass the winter.

After the heavy loss of fruit in 1928, experiments in control were undertaken. Early in March tanglefoot bands were placed on the trunks or main limbs of apple trees in a 20-acre block in the centre of one of the heaviest infestations. The adhesive was applied over a 6-in. band of white shellac. Several less heavily infested marginal rows were left as checks. Most of the beetles stopped $\frac{1}{2}$ inch below the bands as though deterred by the odour ; only a few attempted to cross them, and these were usually caught unless the temperature was low enough to make the tanglefoot firm. In order to destroy the beetles below the bands, blocks of 12–16 trees were treated with 6 poisoned baits. The best results were secured with willow twigs dipped in a suspension of Paris green. The twigs remained green for several days, and the beetles continued to feed on them even after they had withered. The suspension was prepared by adding $\frac{1}{4}$ lb. caseinate spreader to 3 U.S. gals. water and then adding 2 lb. Paris green. Other baits dried out quickly or lost their toxic effect. Bundles of willow twigs were re-dipped in Paris

green every 10 days from April to June, and one or two were placed in each tree, in the crotch just below the bands on the main limbs. The bands were renewed every fortnight. By 10th June only dead beetles could be found. Of 15,000 lb. fruit from the banded area, only 130 lb. was injured by beetles, as compared with 160 out of 475 lb. from the check rows. Dusting infested trunks below the bands with nicotine, pyrethrum, sulphur or sodium fluosilicate failed, and summer oils did not kill the eggs either in the orchard or in the insectary. In 1929, when the control area was widened to cover all marginal infestations and willow baits were applied on 14th April, almost every live beetle had disappeared by 20th May and the crop was practically uninjured.

HOFFMANN (C. H.). **Biological Notes on *Ataenius cognatus* (Lec.), a new Pest of Golf Greens in Minnesota (Scarabaeidae-Coleoptera).**— *J. econ. Ent.* **28** no. 4 pp. 666–667, 5 refs. Geneva, N.Y., August 1935.

The first instance of injury to grass by *Ataenius cognatus*, Lec., occurred in Minnesota in July 1932, when all stages of the beetle were found in large numbers beneath areas of dead turf on a golf course. The literature on the habits of this Aphodiid is reviewed, its distribution in the United States is recorded, and the larva, prepupa and pupa are described. Neither larvae nor pupae were found more than 5 inches below the surface. Adults were reared from larvae and pupae taken on 13th July from a green that had been treated with lead arsenate on 5th July. Field and laboratory observations show that the beetle hibernates only in the adult stage ; it appears to have one generation a year in Minnesota. Adults have been taken in light traps on 1st May and females probably oviposit in May or June. In the laboratory the larvae excavated cells in which they passed a short pre-pupal period. The pupal period in 15 individuals averaged nearly 9 days and all the adults had emerged before 27th August. No stages were found under the turf on 1st September, but adults were numerous in the upper 6 inches of moist parts of piles of waste fertiliser and grass cuttings. Serious infestation may be prevented if all such refuse is removed at least twice a week and scattered thinly, so that it will dry and become unsuitable for the beetle.

LARSON (A. O.), BRINDLEY (T. A.) & HINMAN (F. G.). **Some recent Additions to our Knowledge of the Biology of the Pea Weevil.**— *J. econ. Ent.* **29** no. 4 pp. 668–670, 6 refs. Geneva, N.Y., August, 1935.

In hibernation studies on *Bruchus pisorum*, L. [*cf. R.A.E.*, A **19** 578 ; **20** 24 ; **22** 93], all the beetles in cages in 52 localities in Oregon and Idaho during the winter of 1932–33 where protection was afforded by cracks were killed when the temperature fell to −10°F., but in some places where they were protected by grass and snow some survived temperatures of −23°F. In Idaho during 1931–33, 11 per cent. of beetles in peas stored under warehouse conditions were alive on 27th May after passing two winters, and one of them laid 467 eggs. In the field, pods in individual plantings are suitable for oviposition only for 8–30 days ; but in Idaho during 1933, when a continuous supply of blossom and pods was maintained by regular weekly plantings, oviposition continued over a period of 11 weeks. In the laboratory a few individuals developed from egg to adult during the summer of 1933 and

produced a partial second generation. Two parasites, *Microdontomerus anthonomi*, Cwfd., and an undescribed species of *Eupteromalus* were reared from infested peas in Idaho.

Hervey (G. E. R.) & Palm (C. E.). **A preliminary Report on the Response of the European Corn Borer to Light.**—*J. econ. Ent.* **28** no. 4 pp. 670–675, 3 figs. Geneva, N.Y., August 1935.

An experiment dealing with the response of *Pyrausta nubilalis*, Hb., to light was carried out in New York State in 1933 in two maize fields with a number of traps of the electrocutor type, fitted with 75-watt Mazda lamps. Most moths were caught when the traps were lowered to the height of the maize. The lights were on from 8.15 p.m. until 4 a.m. Moths were observed from 21st June to 1st August, although relatively few were taken after 20th July. Examination of infested stubble showed that emergence was completed on 24th July. Mean night temperatures between 70 and 75°F. were most favourable for flight; below 70°F. it decreased and below 60°F. activity was greatly retarded. Most of the moths were caught between 10 p.m. and midnight, and more than half of them were females. Infestation in the lighted fields was highest near the lights and rapidly became less as the distance from the lights increased, but on the whole it was the same as in comparable fields in the same part of the State.

McAlister, jr. (L. C.) & Anderson (W. H.). **Insectary Studies on the Longevity and Preoviposition Period of the Blueberry Maggot and on Cross Breeding with the Apple Maggot.**—*J. econ. Ent.* **28** no. 4 pp. 675–678, 7 refs. Geneva, N.Y., August 1935.

Curran [*R.A.E.*, A **20** 464] distinguished *Rhagoletis mendax* on blueberry from *R. pomonella*, Walsh, on apple by characters of the male genitalia, but the authors are inclined to regard it as a race of the latter. Adults bred on blueberry in Maine were kept in the laboratory by a modification of the method of Fluke and Allen [**19** 342]. Flies were estimated to live in the field for about 19 days in 1931 and 23 days in 1932, but for the most part they did not live so long on a solution of honey and yeast. High mortality resulted from brief exposure to direct hot sun, both in the field and in the insectary. In 1931 the preoviposition period ranged from 6 to 16 days, and in 1932 from 6 to 21. In a breeding experiment with the strains of *Rhagoletis* from apple and blueberry, 10 unfertilised females of each strain were confined separately with males of the opposite strain. All the males of the blueberry strain paired with the females of the apple strain, but males of the apple strain paired with females of the blueberry strain in only 3 instances. In the first of these crosses, 7 of the females oviposited and 17 larvae and 15 puparia, apparently normal, resulted, but the experiments were left off before the adults could have emerged. In the second cross only one female went through the movements of oviposition, and if it laid any eggs, they were sterile.

Baker (H.). *Phylloxera devastatrix* **Perg. on Pecans.**—*J. econ. Ent.* **28** no. 4 pp. 681–685. Geneva, N.Y., August 1935.

Phylloxera devastatrix, Perg., seems to be the most injurious of the species of *Phylloxera* on pecans in Louisiana, Mississippi and Texas. In Louisiana it chiefly occurs on two varieties. Any part of the current season's growth may be attacked. The young nymph makes a gall

and feeds on the unfolding buds. Many new galls are formed during the first half of April, and afterwards others appear for 1–3 weeks, according to seasonal conditions and the continued presence of new growth. The nymph becomes adult within the gall and lays many eggs in it. The nymphs from these eggs develop into mature winged forms within the gall. Thirty galls contained on an average 750 individuals each. Crowding and natural enemies stop most of the galls from maturing. Those that mature split open from the end of April to mid-June. The winged forms, which live for less than 3 days after emergence, oviposit on the limbs, twigs and leaves near the gall from which they have emerged. The average numbers of eggs laid by individuals is somewhat less than 12, and most of them are laid on the first day after emergence. Cool rainy weather apparently lowers the egg production. The egg stage varies from 4–9 days, with an average of 5–6. The minute forms that hatch from these eggs (in late May or June) pair quickly and shelter in crevices in the bark or under rubbish on the ground near the trunk. Shortly after mating the female develops a single egg and then dies with the egg inside it. There is no further development until the eggs hatch when the buds begin to open in spring. In 1932 only 6 of 68 galls on an artificially infested tree reached maturity, and 34 were destroyed by [unspecified] parasites. The parasites were artificially destroyed before they reproduced, and in 1933, 54 galls formed of which 37 reached maturity. In the field in 1932 when parasites were abundant, 8·68 per cent. of 1,588 galls in one orchard and 9·14 per cent. of 5,927 in another reached maturity.

In 1932 and 1933 several contact insecticides, details of which are tabulated, were tested alone and in combination. Late dormant and delayed dormant sprays of nicotine sulphate (1–800) with either potash fish oil soap (4 lb. to 100 U.S. gals.) or lime-sulphur 32° Bé. (2½ gals. to 100) are recommended. If infestation is light a spray of lime-sulphur (2½ gals. to 100) or of nicotine sulphate with lubricating oil emulsion (½ per cent.) should give satisfactory control. Late dormant and delayed dormant applications were about equally effective, if they were made before the galls formed. Where it is necessary to control *Chrysomphalus obscurus*, Comst., as well as *Phylloxera*, a single late dormant spray of nicotine sulphate (1–800) with lubricating oil emulsion (4–5 per cent.) is recommended.

Douglas (W. A.). **Insects observed attacking *Crotalaria* in Louisiana in 1932 and 1933.**—*J. econ. Ent.* **28** no. 4 pp. 686–687, 1 fig. Geneva, N.Y., August 1935.

In Louisiana nymphs and adults of *Nezara viridula*, L., attack the seed pods of *Crotalaria*, which is grown as a partial substitute for soy beans. The bugs are heavily parasitised late in the season by *Trichopoda pennipes*, F. *Utetheisa bella*, L., was observed attacking *Crotolaria*, for the first time in Louisiana, in May 1933, when about 25 per cent. of the plants in one field were injured. The larvae eat the foliage of young plants and pupate in a light web beneath the leaves. In 1933 lead arsenate dust (6 lb. per acre) used in experiments on plants about 16 inches high gave the best results, and should be used generally against pests of *Crotolaria*. Sodium fluosilicate, barium fluosilicate and calcium arsenate gave fair control. None injured the foliage. *Epicauta lemniscata*, F., after completely defoliating *C. intermedia* passed over adjacent *C. spectabilis* to attack soy beans.

Rust (H. J.). **The Role of predatory Agents in the artificial Control of the Mountain Pine Beetle.**—*J. econ. Ent.* **28** no. 4 pp. 688–691, 1 fig., 1 ref. Geneva, N.Y., August 1935.

Observations on *Dendroctonus monticolae*, Hopk., were made in stands of lodgepole pine [*Pinus contorta*] in Montana in 1928, and of western white pine [*P. monticola*] in Idaho in 1929 and 1930 and in Washington in 1930. Experiments, in which larvae, pupae and young adults were confined in wire-screen cages on the soil surface with fresh logs of *P. contorta* and *P. monticola* or about the bases of trees, showed that all these stages of a fully fed brood of *D. monticolae* that has been exposed by barking the trees can complete their transformation in litter and attack fresh trees. As ants had destroyed some of the beetles in imperfectly designed cages, 46 survival plots representing varying types of cover, at altitudes between 2,500 and 5,400 ft., were established in order to determine the effect of predators on exposed broods. In most of the plots the brood was destroyed within 10 days by ants, centipedes and small mammals. In stands of *P. contorta*, where there is plenty of sunlight and the trash rests on sandy soil, ants are the most valuable predators; in stands of *P. monticola* both ants and small mammals are important; and in stands facing north, where moss is the primary soil covering, the exposed brood is destroyed by centipedes. Young adult beetles seem to have the best chance of surviving exposure and sometimes escape the predators. The species of ants and small mammals found preying on the beetles are listed. There are enough predators in all stands of *P. contorta* and *P. monticola* to make it possible to control the beetles by barking infested trees.

Bigger (J. H.). **Possible Effect of regulated Production on Insect Damage to Corn.**—*J. econ. Ent.* **28** no. 4 pp. 692–695, 3 refs. Geneva, N.Y., August 1935.

Since the reduction of acreages of maize and wheat in the United States during 1934 and 1935 will eventually lead to the cultivation of more clovers, such crop rotations as this change is likely to introduce were tested experimentally in Illinois between 1929 and 1934. Most of the tests ran for 4 years. The alternation of maize with clover (*Trifolium*) or sweet clover (*Melilotus*) and with other cereals greatly reduced the extent to which it was infested by insects. If maize is grown for two years in succession, the crop is inferior, although the rotation is not economically unsound, and unless the rate of increase of infestation dropped, economic damage would result if it were grown for a third successive year. It is believed that a regulated system for crops that would decrease the percentage of maize and increase that of clovers would to a great extent free maize from such pests of the roots and young plants as *Lachnosterna* (*Phyllophaga*), Elaterids, and *Anuraphis maidiradicis*, Forbes, while *Colaspis brunnea*, F., and *Phorbia* (*Hylemyia*) *cilicrura*, Rond., would be easily controlled.

Simanton (W. A.) & Andre (F.). **Two Hemiptera for Use as experimental Insects in Insecticide Studies.**—*J. econ. Ent.* **28** no. 4 pp. 695–696. Geneva, N.Y., August 1935.

The Lygaeids, *Lygaeus kalmii*, Stål, and *Oncopeltus fasciatus*, Dall., have been reared successfully in large numbers throughout the year under laboratory conditions. In most of the United States *L. kalmii*

feeds mainly on milkweeds (*Asclepias* spp.), on which the adults are numerous in late summer and autumn. In the laboratory it lives and breeds on dry seeds and pods of milkweed in glass or muslin cages containing a vial of water, in which is inserted a cellucotton wick, and a small ball of cotton for oviposition. When pairs were caged separately at 30°C. [86°F.] and about 73 per cent. relative humidity (saturated NaCl), the females laid about 1,100 eggs each. There are 5 instars, each lasting 3–8 days, and a generation may be obtained every 30 days. Mortality, which is normally low, may be nearly eliminated by removing the egg masses from the cotton and allowing all eggs of the same age to hatch in a separate cage. *O. fasciatus* is moderately abundant over the southern half of the United States. Though it does not appear to overwinter in the northern States, it may often be taken from milkweed there in late summer and autumn. Females often lay over 200 eggs each. The best results were obtained when each cage contained not more than 30 individuals. It is important that eggs of the same age should be hatched separately. Preliminary studies suggest that *O. fasciatus* is much less resistant to insecticides than *L. kalmii*, on which several common contact poisons appear to have little effect.

JEWETT (H. H.). **The Resistance of Leaves of some pubescent Red Clovers to Puncturing.**—*J. econ. Ent.* **28** no. 4 pp. 697–698. Geneva, N.Y., August 1935.

Tests were made in Kentucky in 1933 with 4 varieties of red clover [*Trifolium pratense*] to determine the force required to puncture the leaves with a special instrument [*R.A.E.*, A **22** 98]. The technique of the experiment and the method of comparing the results are described. The variety that was hardest to puncture was also that previously shown to be the most resistant to *Empoasca fabae*, Harr. [**20** 725]. In the other 3 varieties the difference in force required to puncture them was not quite significant and did not always correspond with their resistance to *E. fabae*.

TROTH (M. S.) & MARSHALL (G. E.). **The Cost of Controlling Apple Insects and Diseases, with special Reference to the Codling Moth.**—*J. econ. Ent.* **28** no. 4 pp. 698–701. Geneva, N.Y., August 1935.

Total costs over 8 years (1926–33) are given for every item of labour and material used in a 200-acre apple orchard in southern Indiana with an average annual production of 57,000 bushels. The total cost of labour and material used in producing a bushel of apples was 77·75 cents, of which 39·6 cents were spent on the control of insects and diseases, including 33·47 cents required for the control of the codling moth [*Cydia pomonella*, L.], which has 3 generations a year in this locality. No allowance is made in this estimate for interest on investment or depreciation in the value of the orchard, and a number of minor costs have been ignored. The cost of washing the fruit was not included. Only fair commercial control was obtained.

BARRETT (R. E.). **A statistical Method of Determining the Efficiency of Banding for Codling Moth, with eight Years' Results.**—*J. econ. Ent.* **28** no. 4 pp. 701–704, 1 ref. Geneva, N.Y., August 1935.

Information based on individual records for 1926–33 from about 210,000 walnut trees in California is examined to determine the

efficiency of 10 oz. burlap bands folded twice to give 4 thicknesses of about 4½ inches wide in destroying larvae of the codling moth [*Cydia pomonella*, L.]. The efficiency of banding, total population and probable error are calculated in the manner previously reported [*R.A.E.*, A **21** 608]. Errors depressing or elevating the calculated percentage of efficiency are enumerated to show that the method is accurate enough for the purpose of the study. The average percentage of the total population of larvae caught in the bands was 5·3 for trees 12–50 years of age, the rougher bark and pruning scars of which lowers the efficiency of the bands, and 22·4 for trees under 12 years of age.

In order to estimate the economic value of this degree of elevation of the environmental resistance, the rate at which the population is built up must be known. A method for getting an approximation to this rate from the available data is indicated, and a formula is given for calculating from it the efficiency needed to hold the population static.

Siegler (E. H.) & Munger (F.). **A Laboratory Spray Apparatus.**—*J. econ. Ent.* **28** no. 4 pp. 704–706, 3 figs. Geneva, N.Y., August 1935.

This sprayer is intended to be used in the apple plug method [*cf. R.A.E.*, A **21** 338] of testing insecticides against newly hatched larvae of the codling moth [*Cydia pomonella*, L.]. It is developed from a compressed air apparatus, originally designed for painting motor-cars. The air, supplied by an air compressor (pressure 25 lb. per sq. in.), is conducted to the sprayer through a flexible hose. The spray material is sucked into the sprayer through a glass tube leading from a large glass container, where the liquid is kept at a constant level during successive tests by a displacer and is agitated by a small propeller, the shaft of which is inserted at an angle and off-centre to prevent centrifugal movement. The objects to be sprayed are carried on a wooden rack through the spray by a leather belt moving at about 1 ft. per sec.

Little (V. A.). **Further Studies on Devil's Shoestring,** *Cracca virginiana* **Linn.**—*J. econ. Ent.* **28** no. 4 pp. 707–710, 2 figs., 3 refs. Geneva, N.Y., August, 1935.

Attempts to cultivate *Tephrosia* (*Cracca*) *virginiana* [*cf. R.A.E.*, A **19** 549, etc.], so that it will yield a product of high and uniform toxicity suitable for commercial use as an insecticide, have been made in Texas for the past 3 years. As a result of ecological studies in several parts of the United States, the most toxic strains are being grown experimentally on a sandy hillside. Methods of planting and propagation are described and compared. At least two years are required to produce a satisfactory root system. Individual plants may yield as much as 1 lb. dried roots, but the average is considerably less. In two seasons, cultivated plants become as large as those estimated to be 10 years old in the uncultivated state, and show marked variations in taxonomic characteristics.

Dearborn (F. E.). **Homologs of Paris Green. I. Lower Members of Acetic Acid Series.**—*J. econ. Ent.* **28** no. 4 pp. 710–714, 9 refs. Geneva, N.Y., August 1935.

The molecular composition of Paris green (copper aceto-arsenite) is discussed from the literature. Avery found Paris green and certain of

its homologues to be compounds of copper meta-arsenite and the copper salt of the acid used to prepare them in which the ratio usually approaches 3 molecules of the former to 1 of the latter, but is sometimes nearer to 2 : 1. The author prepared compounds experimentally by two methods, which are described, using formic, propionic, butyric, monochloracetic, dichloracetic and trichloracetic acids, as well as acetic acid (Paris green). The analyses confirm the conclusions of Avery except that the ratio of the constituents was always very close to 3 : 1. A few laboratory tests on the larvae of mosquitos and of the southern armyworm [*Xylomyges eridiana*, Cram.], in which the compounds used were purified by extraction with carbon tetrachloride, indicate that some of the compounds (which are not specified) are slightly more effective than Paris green.

Diamond (V. R.). **Barium Fluosilicate as a Control for Cabbage Worms (*Pieris rapae* L.).**—*J. econ. Ent.* **28** no. 4 pp. 714–715. Geneva, N.Y., August 1935.

In dusting experiments in Indiana in 1932 and 1933 against *Pieris rapae*, L., on plots of heavily infested cabbages, barium fluosilicate, alone or with a carrier (1 : 1 or 1 : 4), gave far better results than lead arsenate and lime (1 : 10). Hydrated lime, although it seemed to affect the toxicity of the poison, was the best carrier, as it is cheap and has good dusting qualities; clay, flour and talc were also good carriers. An acre of closely spaced plants approaching maturity requires 50–70 lb. dust. These dusts can be used on cabbage until 2 weeks before marketing without objectionable residues if the loose outer leaves are stripped off [*cf. R.A.E.*, A **23** 529]. As the larvae are not likely to harm heads 6–7 inches in diameter, dusting up to this stage is usually adequate.

Cleveland (C. R.). **1934 Experiments with newly developed Types of Oils for Codling Moth Control.**—*J. econ. Ent.* **28** no. 4 pp. 715–726, 1 ref. Geneva, N.Y., August 1935.

Further tests with " soluble " or " emulsible " oils [*cf. R.A.E.*, A **22** 295] were made during 1934 in 2 apple orchards in Illinois heavily infested with codling moth [*Cydia pomonella*, L.]. A 95 per cent. technical white oil (viscosity 80–85 secs. Saybolt) was combined either with an electrolytic metallic naphthenate salt, or with a hydroxy ester of oleic acid and a metallic naphthenate salt. A third combination had the same ingredients as the second but the ratio of the ester to the salt was different. The new oils are clear and liquid compared with the opaque and creamy summer oil emulsions, and they contain no water. The first oil requires calcium caseinate or some other emulsifier in the tank. In the first orchard all plots received a calyx spray of 2 U.S. gals. lime-sulphur, 4 lb. lead arsenate and 4 lb. lime in 100 U.S. gals. water. In the 7 following cover sprays the 3 soluble oils, a dormant miscible oil and summer oil emulsion (mayonnaise type based on the same white oil as the new oils) were used alone and with lead arsenate or nicotine sulphate. In all applications containing lead arsenate hydrated lime was used, at 1½ times the rate. The quantities, concentrations and dates of application, and the percentages of clean, infested and " stung " apples are shown in tables. The first of the new oils, which

was far better than the summer or miscible oils, resulted, when combined with lead arsenate, in less than 1 per cent. infestation, and very little injury by "stings." It had a high ovicidal efficiency; the third oil was not quite so good against the eggs, but it was better than the other sprays. None of the oils combined with lead arsenate throughout the season damaged fruit or leaves more than lead arsenate alone. All the oils at $\frac{3}{4}$ per cent. with nicotine in sprays against the second and third broods caused a little more scorching than the normal schedules, and at $1\frac{1}{2}$ per cent. alone they scorched the leaves and the calyx end of the fruit considerably. Exceptionally hot and dry weather intensified the damage. The new oils gave good coverage, though not so uniform as the dormant oil, but combinations of the first and third soluble oils with nicotine did least harm to the colour and surface of the fruits. All the effective treatments left residues of arsenic and lead above the 1934 tolerance, for the most part even after the apples had been dipped in 1 per cent. cold Vatsol before being washed in 1·29 per cent. cold hydrochloric acid. In the second orchard, in which 2 varieties of apple were grown, a different schedule also showed the superiority of the new oils. There was no severe scorching except when oils were used alone at high concentrations. Oils alone caused the fruit of one variety to be slightly dwarfed. The residue varied with the variety of apple. The residue from oil and nicotine after oil and lead arsenate was smaller but harder to remove than that from oil and lead arsenate. Residue from the new oil and lead arsenate was easier to remove than that from the mayonnaise emulsion and lead arsenate. Dipping the fruit in Vatsol and sodium silicate at 100–104°F. for 45 secs., rinsing, washing in 1·45 per cent. HCl at 62°F. for 2 minutes and rinsing again reduced the residue below tolerance on fruit sprayed with oil and lead arsenate. The new oils neither deteriorate in storage and shipment nor curdle in hard water. They are easy to pour and measure. Fewer applications and lower concentrations are required for control. Oil and lead arsenate followed by oil and nicotine, although generally more effective than lead arsenate alone, is not equal to oil and lead arsenate throughout in preventing larval entry, but it reduced the residue and also helps to control mites and leafhoppers. If oil is applied at such rates that the sum of the percentages for the season is 6, it does not, apparently, cause excessive injury if it is used with lead arsenate or with lead arsenate and lime. It is, however, unsafe for susceptible varieties and under unfavourable conditions at such quantities if any one application consists of $1\frac{1}{2}$ per cent. oil or more and if the oil is not combined with some solid. The addition of lime to any oil and lead arsenate combination makes residues easier to remove. The new oils with nicotine are better than other types of oils with nicotine, but their superiority is more obvious when they are used with lead arsenate.

DANIEL (D. M.). *Hyperplatys aspersus* **Say attacking Peach.**—*J. econ. Ent.* **28** no. 4 p. 727. Geneva, N.Y., August 1935.

Hyperplatys aspersus, Say, was found in dead and dying wood throughout a block of about 10,000 peach trees in New York State during the winter of 1934–35. This Lamiid has not previously been recorded from peach. Hibernating larvae were brought into the laboratory, and adults emerged there in January 1935. All the infested trees had to be removed owing to injury by severe frost in the previous year.

Smith (L. E.), Munger (F.) & Siegler (E. H.). **Phenothiazine, a promising new Insecticide.**—*J. econ. Ent.* **28** no. 4 pp. 727–728, 1 ref. Geneva, N.Y., August 1935.

Phenothiazine [thiodiphenylamine], which is more toxic to mosquito larvae than rotenone [*R.A.E.*, B **23** 119], was quite as effective as lead arsenate against the larvae of *Cydia* (*Carpocapsa*) *pomonella*, L., when tested in the laboratory in a very pure form. It is prepared by fusing 1 part diphenylamine with 2 parts sulphur at 180°C., using iodine as a catalyst. After recrystallisation from toluene, it is a light yellow crystalline compound melting at 180°C. It is a neutral material, insoluble in water and, in the cold, only slightly soluble in mineral oils and the usual organic solvents.

Lipp (J. W.) & Osburn (M. R.). **Aluminium Sulfate as a Sticker for Hydrated Lime in Sprays.**—*J. econ. Ent.* **28** no. 4 p. 728. Geneva, N.Y., August 1935.

In small quantities, aluminium sulphate gave good results in the laboratory as an adhesive for hydrated lime sprays used as repellents against the Japanese beetle [*Popillia japonica*, Newm.]. A solution of aluminium sulphate in water has an acid reaction, and when hydrated lime is added, calcium sulphate and aluminium hydroxide are formed. The calcium sulphate is slightly soluble in water but is difficult to dissolve once it has dried. The aluminium hydroxide, when precipitated, is sticky and gelatinous, but upon drying it is hard and firm. The hydrated lime itself, which would be in excess in the spray combination, is white, the aluminium hydroxide nearly so, and the calcium sulphate white when dry. White residues repell *P. japonica*. Two methods of preparing the spray are described. Sprays of 20 lb. lime, 3 lb. aluminium sulphate and 100 U.S gals. water proved satisfactory in 3 orchards in New Jersey in 1934. The residue was still quite noticeable 6 weeks after the last of 4 applications made over a period of 5 weeks on early peaches. The residue from an equal quantity of hydrated lime alone or with 3 lb. flour or 1 U.S. pt. Menhaden oil was not so persistent.

Ebeling (W.). **Effect of Paraffin Wax Emulsions on the Oil-depositing Properties and insecticidal Efficiency of Oil Sprays.**—*J. econ. Ent.* **28** no. 4 pp. 728–729. Geneva, N.Y., August 1935.

It has been found that if *Citrus* trees are sprayed with paraffin wax emulsions before being sprayed with oil the deposit of oil and its insecticidal value are increased. When the wax emulsions were poured into the spray tank with the oil, the same effect was obtained, and only one application was required. To make the emulsion, melted paraffin wax (M.P. 47–49°C.) was added to almost boiling water, which contained triethanolamine stearate or triethanolamine oleate as the emulsifier. The resulting emulsions contained about 30 per cent. wax by weight. Spermaceti wax (M.P. 44°C.) was as good as paraffin wax. The emulsified wax forms a colloidal suspension when diluted with water. Examination of 172,878 California red scales [*Aonidiella aurantii*, Mask.] on lemon trees, showed that the average number of insects surviving treatment with a given concentration of heavy oil alone was reduced by half if wax emulsion (0·66–1 per cent.) was added

to the oil spray. The wax emulsion increased the deposit of oil and emulsions of wax concentrations up to 5 per cent. had no perceptible effect on the trees.

Fulton (R. A.) & Bergen (H. G.). **Economic Injury to Beans from the Activities of the Mason Bee** *Osmia pellax* **Sandhouse.**—*J. econ. Ent.* **28** no. 4 pp. 729–730, 1 ref. Geneva, N.Y., August 1935.

In June 1934, what is apparently the first record of *Osmia pellax*, Sandhouse, defoliating beans was obtained from Idaho. A field of 4 acres was severely injured. The entire leaf, with the exception of the mid-rib, was often removed. The yield was thought to have been reduced by one-third. By harvest the plants had recovered, but their development had been retarded for 2–3 weeks. The bees rolled the chewed-up material between their forelegs into small balls, which they carried off to line their underground egg-cavities. The site and construction of the nests are described. Plants on the edge of the infested area were sprayed with lead arsenate, and many of the egg-capsules were destroyed by harrowing the soil of the nesting place, but the value of these measures for control was not ascertained.

Sadler (W. O.). **Biology of the Midge** *Chironomus tentans* **Fabricius, and Methods for its Propagation.**—*Mem. Cornell agric. Exp. Sta.* no. 173, 25 pp., 2 pls., 2 figs., 10 refs. Ithaca, N.Y., March 1935.

A detailed account is given of investigations carried out at Ithaca, N.Y., in 1930–32 on the bionomics of *Chironomus tentans*, F., and on methods for its artificial propagation as a food for young fish in hatcheries. It is concluded that this Chironomid, which has a high reproductive capacity and a short life-cycle, can profitably be reared in small ponds treated with an artificial fertiliser, soy-bean meal being the best of those tested.

Sorenson (C. J.). **Chalcis-fly Infestation of Alfalfa-seed and Parasitism of the Chalcis-fly in Utah, 1930 to 1933, inclusive.**—*Proc. Utah Acad. Sci.* **11** pp. 241–244. Provo, 1934. [Recd. August 1935.]

When both the first and second crop of lucerne are left for seed in the same or neighbouring fields in Utah, the seed chalcis-fly [*Bruchophagus gibbus*, Boh.] is likely to be numerous because it has seeds available for oviposition over a long period. The eggs are inserted before the seed contents become solid, and the larvae eat all the contents. In 1930–33 random samples of seed-pods were collected during August–September from representative seed fields. The samples from each field were thoroughly mixed in the laboratory, and from each composite field sample 1,000 seeds were examined under a microscope. The average percentage of infested seeds for the whole State was 10·88 in 1930, 13·72 in 1931, 11·58 in 1932, and 8·65 in 1933.

Parasites that emerged in the laboratory from samples of seeds were *Eutelus bruchophagi*, Gah., and *Liodontomerus perplexus*, Gah., which together parasitised 21·13, 8·21, 9·44 and 6·82 per cent. of *Bruchophagus* in the 4 years 1930–33, respectively, and, in small numbers, *Habrocytus medicaginis*, Gah., *Tetrastichus bruchophagi*, Ashm., and *Eupelmella vesicularis*, Retz.

Sorenson (C. J.). **Some Hyperparasites of the Alfalfa Weevil Parasite, *Bathyplectes curculionis* (Thoms.) occurring in the Uintah Basin of Utah.**—*Proc. Utah Acad. Sci.* **11** pp. 249–251, 6 refs. Provo, 1934. [Recd. August 1935.]

Infestation of lucerne by *Hypera variabilis*, Hbst. (*Phytonomus posticus*, Gyll.) in Utah increased rapidly from 1926 to 1932, but in 1933 was much less. Among cocoons collected from sample lucerne fields in June and kept in the laboratory until pupation was completed, the percentages parasitised by the Ichneumonid, *Bathyplectes curculionis*, Thoms., were 30·5, 32·13, 70·84 and 96·60 in the years 1930–33, respectively. In 1931 the following hyperparasites were reared from pupae of *B. curculionis* : 3 species of *Habrocytus* and 1 of *Eupteromalus*, all probably new, *Dibrachys cavus*, Wlk. (*boucheanus*, Ratz.), *Catolaccus aeneoviridis*, Gir., *Tetrastichus bruchophagi*, Ashm., and *Eupelmella vesicularis*, Retz. From 1 to 6 hyperparasites and occasionally 2 different species emerged from a single pupa. *Eupteromalus*, *Habrocytus* and *Dibrachys* were observed to have fed in their larval stage as primary parasites on pupae of *Hypera*.

Bourne (A. I.) & Whitcomb (W. D.). **Department of Entomology.**—*Bull. Mass. agric. Exp. Sta.* no. 315 (Ann. Rep. 1934) pp. 38–52. Amherst, Mass., March 1935. [Recd. August 1935.]

In this summary of work in Massachusetts during the year ending 30th November 1934, the results of tests against various pests are shown. Proprietary rotenone dusts and proprietary sprays of derris and of pyrethrum and derris were effective against the gladiolus thrips [*Taeniothrips simplex*, Morr.]. In combination with molasses and water, Paris green or calcium arsenate injured the plants, but lead arsenate did not, and gave good control of the thrips. Combinations of lead arsenate with various wettable sulphurs gave satisfactory results against scab and pests [*Cydia pomonella*, L., etc.] on apple and avoided the injury caused by lead arsenate and lime-sulphur. Dusts of derris (0·4–0·6 per cent. rotenone), of pyrethrum and sulphur (0·05 per cent. pyrethrins), and of copper sulphate, lead arsenate and lime (20 : 10 : 70) were effective against the striped cucumber beetle [*Diabrotica melanocephala*, F.] on cucurbits in the laboratory and in the field, but the last caused slight injury and decreased yield on melons during very hot weather. Various dusts of pyrethrum and of derris (with clay as the carrier) caused a marked reduction in infestation by the white apple leafhopper [*Typhlocyba pomaria*, McAtee], but pyrethrum seemed somewhat better than derris. In field tests against the squash vine borer [*Melittia satyriniformis*, Hb.], 2 per cent. oil emulsions, combined sprays of lead arsenate, nicotine sulphate and soap, and the standard treatment with nicotine sulphate (1 : 250) were all inferior to a spray of 1 per cent. white lubricating oil emulsion and nicotine sulphate (1 : 500). A 4 per cent. dust of calomel (mercurous chloride) and lime (2–4 weekly applications from 7th May) controlled the larvae of cabbage fly [*Phorbia brassicae*, Bch.] and increased the percentage of large heads, and mercury bichloride (1 : 1,000) applied when the eggs were first found gave similar results, but 2 applications to radishes, although they gave moderate control, stunted the plants. Of insecticides applied weekly to potatoes from June to late August in combination with Bordeaux mixture, the best was a rotenone spray, which gave excellent control of flea-beetles [*Epitrix cucumeris*, Harr.]

on potatoes, had a repellent effect, prevented injury by Aphids and leafhoppers [*Empoasca fabae*, Harr.], and increased the yield of the plants. Against the onion thrips [*Thrips tabaci*, Lind.], rotenone sprays were nearly as effective as a spray of nicotine sulphate and fish-oil soap and had considerable residual effect. In investigations on resistant strains of onions, it was found that plants in which the growing point was completely enclosed by the older leaves had most thrips. The entomogenous fungus [*cf. R.A.E.*, A **21** 417; **22** 650] that attacks the thrips was abundant in 1934.

In experiments on the date of emergence of the apple maggot [*Rhagoletis pomonella*, Walsh.], most adults appeared on 18th July from light soil exposed to direct sunlight and on 25th July from soil in the shade. The corresponding dates for heavy soil were 22nd and 28th July. Emergence was always earlier from cultivated soil than from land under sod. More than 18,000 individuals of *Macrocentrus* [*ancylivorus*, Rohw.] were liberated in July against the oriental fruit moth [*Cydia molesta*, Busck] on peach. In orchards in the west, 70–90 per cent. parasitism was recorded where liberations had been made for several years, and 45–70 where liberations over shorter periods had been made. In the eastern orchards, where only a small number of parasites survived the winter, the degree of parasitism averaged 20–30 per cent. in large orchards and 50–70 in smaller ones.

Light traps used in tests on codling moth [*Cydia pomonella*, L.] consisted of a 75-watt lamp suspended over a pan of water or inside a screen charged with about 1,100 volts to electrocute the insects. The lights, which were operated from 18th June to 28th August, proved of value in timing sprays, and a reduction in infestation of apples in and near the trees in which they were hung suggested that they might also be an aid in supplementary control when combined with the regular spray programme. *Dasyneura mali*, Kieff., was less injurious on apples in 1934 than in 1933 [*cf.* **22** 398], and no new outbreak areas occurred. Data on the life-history in one locality are given. The majority of the larvae of all generations hibernated. Although calcium cyanide and naphthalene applied as soil insecticides under the trees reduced the average number of adults emerging per sq. ft. from 11·5 to 1·83, the infestation remained heavy on treated trees. To determine the relation between temperature and the effect of sprays against the plum curculio [*Conotrachelus nenuphar*, Hbst.] [*cf.* **22** 473, etc.], successive rows of heavily infested apple trees were sprayed with lead arsenate and fish oil every other day for 12 days beginning on 22nd May, 4 days after the calyx application. On calculations from the maximum daily temperatures, the most timely sprays would have been applied between 27th and 29th May, and the percentage of damaged fruit decreased regularly from 48·9 per cent. for trees sprayed on 22nd May to a minimum of 18 per cent. for those sprayed on 28th May, and increased to 44·66 per cent. for those sprayed on 1st June.

Early carrots were practically uninjured by the carrot rust fly [*Psila rosae*, F.] because of dry hot weather in early summer, but 10 to 27 per cent. of the late planted carrots showed injury on account of cool wet weather in August and September. Although treating the seed with mercurous chloride mixed with inert clay in varying quantities gave beneficial results with early plantings, it did not remain active long enough to give protection against the second and third generations. Greenhouse fumigation experiments [*cf.* **22** 474] with naphthalene against red spider [*Tetranychus telarius*, L.] indicated that exposure

for at least 3 hours to an atmosphere saturated with naphthalene is necessary to cause appreciable mortality, and as saturation exists when 0·64 oz. naphthalene is vaporised in 1,000 cu. ft. of air at 77°F., about twice as much vapour is lost and absorbed as is retained in the air during fumigation with 2 oz. naphthalene per 1,000 cu. ft. for 6 hours. Notes are given on a new type of fumigator. Injury by naphthalene to the buds of chrysanthemum does not occur if they are more than $\frac{1}{8}$ inch in diameter. The generalised results of further preliminary work on the influence of temperature on the effectiveness of sprays against *T. telarius* are summarised.

STRAND (A. L.). **Montana Insect Pests for 1933 and 1934. The twenty-fifth Report of the State Entomologist of Montana.**—*Bull. Mont. agric. Exp. Sta.* no. 294, 40 pp., 7 figs. Bozeman, Mont., December 1934. [Recd. August 1935.]

An account is given of the control campaign carried out in Montana against grasshoppers in 1933 and in 1934, when the outbreak was the most severe experienced in the State. Details are given of the quantities of bait used, the numbers of farmers using it, the area treated and the numbers of mechanical spreaders in operation. The value of wheat saved alone is estimated at over 37 times the cost of control. As the dominant species in 1934 was *Melanoplus mexicanus*, Sauss., which, unlike other species, deposits its eggs mostly in stubble fields, an effort was made to supplement poison baits by having all heavily infested fields ploughed in. Deep ploughing in moist soil that was afterwards well worked down was effective, but the eggs hatched in rather dry soil that was not well ploughed. The value of egg surveys is pointed out. The amount of bait used in 1934 was over 16,000 tons, out of an estimated requirement of about 18,000, but the estimate for 1935 is little more than 3,000 tons, only one county, as compared with 18 for the previous year, being rated at 50 per cent. infestation.

Injury to grain crops by *Chlorochroa sayi*, Stål, which was first observed in Montana in 1932, became more severe in 1933, and in 1934 several thousand acreas of wheat were destroyed in the central north. The milky juice is sucked out of the heads of grain. In the Rocky Mountain States the species occurs spasmodically. Only the adults and last instar nymphs attack cereals, the younger stages living almost entirely in Russian thistle [*Salsola*]. Adults overwinter under weeds, etc., which should be destroyed.

Anabrus simplex, Hald., which became numerous in 1933, caused serious losses to cereals and other crops. In 1934, measures were not begun until late May, and as the crickets were not prevented from ovipositing, control was not obtained, though migrations to cultivated crops were for the most part intercepted. *Porosagrotis* (*Agrotis*) *orthogonia*, Morr., caused severe damage to wheat in 1933, but there were practically no losses in 1934. In 1932 only 3 meteorological stations recorded less than 4 inches of rainfall for May, June and July [*cf.* **20** 691]. Lower rainfalls were recorded from 13 stations in 1933 and from 27 in 1934. It is improbable, however, that there will be injurious infestations during 1935 except near 3 stations where less than 4 inches was recorded in May, June and July in both 1933 and 1934.

Curly top, first recorded in Montana in 1934, affected 2–10 per cent. of the sugar beet in one place, although few individuals of *Eutettix*

tenellus, Baker, could be collected in the fields. *Leptinotarsa decemlineata*, Say, was far more abundant on potato throughout the State than for several seasons. *Pieris rapae*, L., and *Brevicoryne brassicae*, L., were unusually abundant and destructive on cabbage.

Myzus cerasi, F., on cherry was controlled by sprays of nicotine sulphate (1 : 800) and soap or summer oil on 24th March and 12th April, at the beginning and end of the hatching period. Spraying is ineffective after the leaves have begun to curl. The spray containing soap (3 lb. to 50 U.S. gals.) gave 95 per cent. control and that containing oil (4 per cent.) gave 98 per cent. A third spray shortly before picking would destroy stray migrants. *Lepidosaphes ulmi*, L., is the chief pest of apples in one district, where lime-sulphur does not seem to be effective in its control and lye has failed to kill the eggs. Colonies of *Ascogaster carpocapsae*, Vier., were liberated where *Cydia* (*Carpocapsa*) *pomonella*, L., causes heavy losses to apple. *Chermes* (*Adelges*) *cooleyi*, Gill., was very abundant in western Montana on Colorado blue spruce [*Picea pungens*] during 1933 and 1934, and *Melasoma lineatopunctata*, Forst. (*Lina scripta*, F.), *Chrysomela lapponica interrupta*, F., *Zeugophora scutellaris*, Suffr., and *Brochymena arborea*, Say, were destructive to poplars in both years. *Erythroneura ziczac*, Walsh, which has been working westward up the Yellowstone River for years, crossed the divide into the Gallatin Valley in 1932 or 1933 and has become extremely destructive to vines in Bozeman.

Entomology.—*Rep. S. Carolina Exp. Sta.* **47** (1933–34) pp. 56–64, 1 fig. Clemson Coll., S.C., December 1934. [Recd. August 1935.]

Observations by O. L. Cartwright on pests of maize in South Carolina in 1933–34 showed that adults of the overwintered generation of *Diatraea crambidoides*, Grote, could emerge as early as 8th May and as late as 5th July. Rice weevils [*Calandra oryzae*, L.] laid an average of 173·6 eggs in maize [*cf. R.A.E.*, A **22** 697], with a maximum of 249. The maximum life of a female was 152 days. The egg, larval and pupal stages averaged 4·41, 22·22 and 5·25 days. Shelled maize treated with dusting sulphur (1 oz. per bushel) was completely protected. In preliminary tests small amounts of paradichlorobenzene renewed at intervals of 2 months gave good control. Dipping maize cobs in cotton seed or lubricating oil (1 part oil and 8 parts water emulsified with laundry soap) gave complete protection against all grain pests. Oils in greater dilution gave diminishing control. Of cotton boll weevils [*Anthonomus grandis*, Boh.] placed in cages in 1933, 2·53 per cent. survived the winter and emerged between 9th April and 5th July 1934. More adults emerged from hibernation in cages placed in an exposed situation on a hill, than in those in a sheltered ravine [*cf. R.A.E.*, A **22** 70].

Cartwright also reports that *Cydia* (*Grapholitha*) *molesta*, Busck, injured 25–100 per cent. of the peach twigs in one young orchard. The percentage of infested peaches increased from 12 in early August to 23 towards the end of the month. The maximum numbers of larvae of the various generations were present about 25th May, 23rd June, 13th July, 4th August and 15th September. Since 1930, 85 colonies of parasites have been liberated in 32 orchards, and attempts to establish 7 different species were made in 1933. *Macrocentrus ancylivorus*, Rohw., and *Glypta rufiscutellaris*, Cress., were recovered in 1934 from twigs collected in commercial orchards during the first generation's activity.

No larval parasites emerged from infested material collected in another group of orchards before 6th July and only 1 per cent. of material collected later was parasitised. Before 30th July no pupal parasites were obtained, but between 1st and 15th August parasitism was 6·5 per cent. and between 15th and 31st August 39·4 per cent.

In studies by J. E. Webb, adults of *Utetheisa bella*, L., were active in the field on 19th May, but did not oviposit on cultivated *Crotalaria* until early June. Up to 14th September there were nearly 4 complete generations on *Crotalaria*. Development from egg to adult in the 1st generation averaged 25·18 days, and for the 2nd, 3rd and 4th generations was almost the same. The generations overlap, however, and larvae of the last 3 were all developing in the insectary on 14th September. As many as 598 eggs were laid by one female. Several Tachinids parasitised about 50 per cent. of the larvae and pupae in July, and about 40 per cent. in August. In laboratory tests a dust of 1 lb. Paris green and 3 lb. lime killed 90 per cent. of the larvae in 24 hours.

J. G. Watts states that infestation of cotton by the thrips, *Frankliniella tritici*, Fitch, *F. fusca*, Hinds, and *Thrips tabaci*, Lind., was much less in 1934 than in previous years. Second instar larvae of *F. tritici* were found on oats about the middle of February, although it was previously thought that only the adults overwintered. *Psallus seriatus*, Reut., which has not been injurious on cotton since 1928 [*cf.* **17** 165], was abundant in localised areas in the early summer of 1933, but prolonged rains made the infestation insignificant. In 1934 *P. seriatus* was abundant on cotton between 11th August and 15th September. As a result of the combined attack of *A. grandis* and *P. seriatus*, little fruit was set on the upper third of the cotton plants in one locality. The Jassids, *Empoasca fabae*, Harr., *Graphocephala versuta*, Say, and *Alconeura unipuncta*, Gill., also bred in large numbers on cotton.

In investigations by F. Sherman and J. N. Todd on the Mexican bean beetle [*Epilachna corrupta*, Muls.], an average of 17·45 per cent. of the beetles collected in October 1933 survived the winter in field cages. The percentage of emergence in a sheltered wooded ravine was 22·55 as compared with 12·35 in open woods on a hill. Two overwintering beetles were found in sheltered situations in the field. Control tests with proprietary compounds containing pyrethrum, rotenone and nicotine gave inconclusive results. In feeding experiments, the beetles preferred beans to *Crotalaria*, lucerne or ground-nuts.

GIBSON (A.). **Insect Pests of the Rose and their Control.**—*Bull. Dep. Agric. Canada* (N.S.) no. 17 revd pp. 52–55. Ottawa, 1935.

Notes are given on the more important pests of roses in Canada. *Macrodactylus subspinosus*, F., injures the blossoms in southern Ontario; *Rhynchites bicolor*, F., punctures the young buds in western Canada; and *Tortrix* (*Cacoecia*) *rosaceana*, Harr., feeds on the leaves and flower buds and *Pyrrhia umbra*, Hb., sometimes eats into the buds in eastern Canada. Collecting these insects by hand is an effective control. When infestation is very severe, lead arsenate, 12 oz. to 10 gals. water against *M. subspinosus* and *R. bicolor* and 8 oz. to 10 gals. against *P. umbra*, should be used. Aphids can be controlled by sprays of whale-oil soap (1 lb. in 5 gals. water) or nicotine sulphate, and the Coccids, *Aulacaspis rosae*, Bch., and *Lepidosaphes ulmi*, L., by treating the infested shoots with lime-sulphur (1 : 7) or a whale-oil

soap solution (1 lb. to 1 gal.) in late summer or early autumn or in early spring before the buds burst. The removal and burning of badly infested shoots is effective against both Coccids and *Neocerata* (*Dasyneura*) *rhodophaga*, Coq. Galls of *Rhodites rosae*, L., and *R. radicum* O.-S., which infest the stem and roots respectively, should be cut out and burnt. Pests that feed only on the leaves include *Typhlocyba rosae*, L., against which a spray of nicotine sulphate and soap is effective, and the sawflies, *Caliroa aethiops*, F., *Cladius isomerus*, Nort., and *Emphytus cinctus*, L. (*Allantus cinctipes*, Nort.), which are controlled by lead arsenate (4 oz. to 10 gals.).

GILLIATT (F. C.). **The European Red Mite, *Paratetranychus pilosus* C. & F. in Nova Scotia.**—*Canad. J. Res.* (D) **13** no. 1 pp. 1–17, 4 diagr., 15 refs. Ottawa, July 1935.

This insectary and field study on *Paratetranychus pilosus*, C. & F., was carried out in Nova Scotia during 1930–32. The history, distribution and numerous food-plants of the mite are briefly reviewed from the literature. In Nova Scotia, it is of importance as a pest of apple. A few adults and winter eggs have been found on pear and plum, but only in the neighbourhood of apple trees, and though other food-plants are attacked, they are not severely infested. The nature of the damage [*cf. R.A.E.*, A **17** 391] and the method of rearing in the laboratory are described. The mites do not seem to spread far in large numbers, but winds carry the webs that are spun round the winter eggs to other trees and the eggs with them. The average mean temperatures for 1930 and 1931 are correlated with the average lengths of the egg stage (except winter eggs) and subsequent development for each generation. All stages are susceptible to variations in weather conditions. A few warm days in May may cause the winter eggs to hatch, but a sudden lowering of temperature or wet and cold weather after hatching has begun almost entirely suspends hatching. The young mites remain semi-dormant during cold, wet weather. They often remain completely submerged in drops of water for several hours without being harmed. There are 2 complete and 3 partial generations in Nova Scotia. The females of the 1st and 2nd generations deposit summer eggs only, those of the 3rd and 4th deposit summer and winter eggs, and those of the 5th winter eggs only. The generations are active during May–June, June–July, July–August, August–September and throughout September and October, respectively. The summer eggs are laid on the leaves, usually on the lower surface. Most of the winter eggs are laid on the branches but a few occur on the fruit near the calyx. In both years the first winter eggs were found in the field on 22nd July, and a few days later in the rearing cages. The last eggs were laid in the cages about the end of October, but during these years the frosts occurred 3–4 weeks later than usual. Data on the life-history during 1930 and 1931 are presented in tables and graphs. The incubation period averaged somewhat over 9 days in the 2nd, 3rd and 4th generations and 11·5–13 in the 5th. In the field not more than 17 per cent. of either summer or winter eggs died. The young larvae crawl to the limbs and feed on the leaves, mainly on the lower surface. The larvae and nymphs do not migrate unless they are overcrowded. Each of the 3 instars is divided into an active feeding period and a dormant period, of almost equal length, which is usually passed on the

under side of the leaf. In the insectary the average length of the life-cycle was 23·35 days in 1930 and 25·59 in 1931. In 1931 the longevity of the females averaged 13·24 days in the 2nd generation and 24·25 in the 5th. The average numbers of eggs laid by single females varied from less than 10 to above 30 ; females of the 5th generation laid far less eggs than those of the others. The length of the life-cycle increased from just below 20 days in the 1st generation to just above 30 in the 5th. Oviposition was observed to take place at 44°F. Only males were produced by parthenogenesis. The males are much more active than the females, but in the cages they died within 1–3 days of pairing.

Plummer (C. C.) & Stone (W. E.). **The Disposal by Burial of Fruit infested with Larvae of the Mexican Fruit Fly.**—*Circ. U.S. Dep. Agric.* no. 349, 15 pp., 1 fig., 5 refs. Washington, D.C., June 1935.

The following is based on the authors' summary : In previous experiments in the disposal by burial of fruit infested with larvae of *Anastrepha ludens*, Lw. [*cf. R.A.E.*, A **18** 377] some adults emerged from fruit buried as deep as 18 ins. In an experiment at Morelos, Mexico, in 1931, in which infested mangoes were buried in pits exposed to the sun, adults emerged from pits 18–27 ins. deep, but only from those in which the soil was not packed. The larvae sometimes passed through the soil for considerable distances before pupating, but most of them pupated near the fruit at the bottom of the pit. It is suggested that infested fruit should be covered with at least 4 ft. of soil if the soil is not packed, but when it is packed, 18 ins. should be enough. In dry weather after rain, there was a tendency for fissures to open at the edges of the pits when soil of the adobe type was used. Burial pits should be examined occasionally to make sure that no flies are emerging through these fissures or from passages made in the soil by such burrowing insects as Lamellicorn larvae. In a further experiment in 1932 no adults of *A. ludens* emerged from 18 ins. of either wet or dry sand packed above infested mangoes. Most of the puparia were in the soil surrounding the fruit. In the dry sand one adult was found 9 ins. above the level of the fruit, but most of the adults were within 4 ins. of it. One dead larva was 11 ins. above. Moistened sand becomes so compact that it is improbable that flies could pass through it. It is thought that the results will also hold good for *Citrus*. An experiment in Mexico City in 1933 with local alluvial sand and common soil showed that the soil possessed better packing qualities than the sand, the packing quality of which increased with its fineness. The moisture content of the material was found to be the most important factor. Double packing is advisable to secure uniform treatment.

Landis (B. J.) & Plummer (C. C.). **The Mexican Bean Beetle in Mexico.**—*J. agric. Res.* **50** no. 12 pp. 989–1001, 5 figs., 12 refs. Washington, D.C., 15th June 1935.

A study of *Epilachna corrupta*, Muls., was made in 1930 in Mexico. A list of the localities where it has been recorded is given. It is found at elevations up to nearly 9,000 ft., but is commonest between 5,000 and 7,000 ft., and chiefly occurs in the central plateau enclosed by the 20°C. [68°F.] isotherm where beans are most extensively cultivated. It seems to be very rare in hot, damp coastal regions. Where there is a pronounced dry season, it is in the fields only during the wet summer

months. Where it is known to be present, the annual rainfall varies from 10 to 60–85 ins. and extremes of temperature vary considerably. In Mexico City the temperature rises rapidly from January to May and decreases during the 4 rainy months that follow. The overwintered beetles do not appear until the summer rainy season ; in 1929 and 1930, it began about 2 weeks before their emergence. In one locality where the summer bean crop is grown without irrigation, all the plants were defoliated. In 1929, larvae and adults migrated from plants that had been killed by defoliation and October frosts to sheltered and uninjured plants. These plants were sprinkled with water for several hours each day, and all stages of the insect were present on 3rd February, 4 months later than their normal occurrence in the field.

Near Mexico City, the low mean daily temperatures precluded the development of more than one generation. Infestation was worst not far from mountains in a large, dry lake bed planted each year with maize and beans. The soil is a fine silt and alkaline. Some plants were completely defoliated, but others were only slightly and less than half badly injured. In life-history studies under field conditions, oviposition continued from the first week in June until September. The maximum number of overwintered adults were present in late June. Towards the end of the season the rate of oviposition decreased. The average durations of the stages and (in brackets) the average mean daily temperature and average relative humidity for the periods in which they were observed were: egg 13 days (16·9°C. [62·42°F.] and 72·1 per cent.) ; larva 33 days (17·2°C. [62·96°F.] and 69·7 per cent.) ; pupa 11 days (17·4°C. [63·32°F.] and 67·3 per cent.). In the second week of September the beetles ceased feeding and remained quiescent in protected places on the plant. They were found in the field until the early October frosts destroyed the plants. It is not known where they pass the dry season from October till June, but an adult beetle had been found in wheat stubble in the winter of 1928.

Schwerdtfeger (F.). **Studien über den Massenwechsel einiger Forstschädlinge. III. Untersuchungen über die Mortalität der Forleule (*Panolis flammea* Schiff.) im Krisenjahr einer Epidemie.** [Studies on the Variation in Abundance of some Forest Insects. III. Investigations on the Mortality of the Pine Noctuid, *P. flammea*, in the Year when an Outbreak collapsed.]—*Mitt. Forstwirt. Forstwiss.* 1934 pp. 417–474, 23 figs., 60 refs. Hanover, 1934. [Recd. August 1935.]

A severe infestation of pines in eastern Prussia by *Panolis flammea*, Schiff., reached its peak in 1932 and subsided in 1933. To ascertain the factors concerned, observations were made in 54 forestry divisions in areas where no trees had been dusted with insecticides. The mortality in each stage from egg to adult is examined and commented on.

The following is taken largely from the summary: The number of pupae destroyed by predators was considerable in the late summer and autumn of 1932, less in the following spring and very small in the winter. The reduction was greatest in old stands and in places where highly developed undergrowth provided a good environment for predacious mammals, birds and such insects as *Calosoma*, which,

according to rough estimates, were sometimes responsible for destroying 2, 8 and 40 per cent. respectively of the pupae. In general 70-85 per cent. of the pupae were healthy ; 4–27 per cent. were parasitised ; 1–14 were decomposed by bacteria ; and 0–2 were infested by the fungus, *Isaria farinosa*. The percentage of parasites was lower in forests where the host was abundant. In 1933, in stands where the pines had all their needles, the egg production per female was 150–160 ; in almost completely defoliated stands it was only 80. The females laid almost all their eggs. A cold spell of nine days, accompanied by extremely bad weather, occurred during the flight period, and 43–58 per cent. of the adults were destroyed or prevented from reproducing. There appeared to be a migration of adults from heavily infested stands to less defoliated ones. Mortality was slight in the egg stage. On an average 1 per cent. of the eggs were unfertilised, 0·1 per cent. were eaten by predators, 1·3 per cent. were parasitised, and 10·4 per cent. were destroyed by unknown causes. The greater the population density of the preceding generation the greater was the proportion of dead or parasitised eggs. During the period of feeding there was a larval mortality of from 76·4 to 100 per cent., and as most of the larvae that descended from the trees died before pupating, the total larval mortality was 98·9–100 per cent. Mortality due to weather occurred only in the first instar, and an average of 15 per cent. perished. Some of the newly-hatched larvae failed to reach the May shoots and starved. From 5 to 10 per cent. of the larvae were killed by predators. The Tachinid, *Ernestia rudis*, Fall., which parasitised nearly all the remaining larvae, put an end to the outbreak. Lack of food promoted bacterial disease, but was not an essential preliminary. It is considered that abiotic factors rarely cause the collapse of an infestation ; it is only exceptionally that weather contributes in ending an outbreak. Biotic factors are most often responsible, and of these *E. rudis*, fungus and bacterial diseases in the larval, and predators in the pupal stage are the chief.

VON OETTINGEN (H.). **Die wichtigsten grasbewohnenden Fliegenlarven Norddeutschlands.** [The most important Grass-inhabiting Fly Larvae of North Germany.]—*Nachr. Schädlingsbekämpf.* **10** no. 2 pp. 62–70, 14 figs., 10 refs. Leverkusen, July 1935. (English Summary p. 101, French p. 104, Spanish p. 106.)

This paper describes the characters distinguishing the larvae of the chief Diptera that infest grasses in North Germany, namely, *Chlorops taeniopus*, Mg., *C. brevimana*, Lw. (*fulviceps*, v. Ros.), *Meromyza saltatrix*, L., *Oscinella frit*, L., *Lasiosina cinctipes*, Mg., *Anthracophaga strigula*, F., *Amaurosoma flavipes*, Fall., *Phorbia* (*Chortophila*) *genitalis*, Schnabl, *Phorbia* (*C.*) *dissecta*, Mg., *Phorbia* (*C.*) *cilicrura*, Rond., *Hylemyia coarctata*, Fall., *Agromyza albipennis*, Mg., and *Hydrellia griseola*, Fall.

JANCKE (O.). **Ueber Spritzschäden an Kirschen nach Anwendung von Fluornatriumlösungen zur Bekämpfung der Kirschfliege.** [On Spray Injury to Cherries after the Use of Sodium Fluoride Solutions against the Cherry Fly.]—*Anz. Schädlingsk.* **11** nos. 7–8 pp. 81–84, 92–94, 7 figs. Berlin, July–August 1935.

Experiments were made at Naumburg a. S., Germany, to find out why sodium fluoride bait-sprays, which had not caused any injury

in 1931 and 1932 and were highly effective against the cherry fruit-fly [*Rhagoletis cerasi*, L.], had scorched the cherries and leaves in 1933. In injured trees the loss sometimes amounted to 12 per cent. of the crop, but the total crop loss was much less, as many sprayed trees were unharmed. In experiments the injury was caused by sodium fluoride alone at a concentration of 0·4 per cent. Sugar or molasses, the method of spraying, or existing infection with *Gloeosporium fructigenum* had no effect on the degree of injury. The amount of solution was not always a factor. Scorching soon appeared on the leaves, but only became apparent on the fruits a fortnight after spraying. Weather acted indirectly, for the fruits were less resistant in 1933 after bad weather in May, and a high air-humidity gave rise to dew which re-dissolved the sodium fluoride that had dried on the sprayed fruits and so produced a concentrated solution on the weakened skin.

Schmalfuss (H.) & Jacoby (M.). **Zur Bekämpfung der Blattschneiderameise, *Atta sexdens* L. Die Ausbreitung von Giftgasen im Nest.** [On the Control of the Leaf-cutting Ant, *A. sexdens*. The Spread of Poison Gases in the Nest.]—*Anz. Schädlingsk.* **11** no. 8 pp. 85–89, 9 figs. Berlin, August 1935.

In order to determine how poisonous gases spread in nests of the leaf-cutting ant, *Atta sexdens*, L., a series of tests were made with nests in Brazil and supplemented by laboratory tests in Germany with an apparatus built of glass tubing arranged like the galleries of a nest, in which pieces of litmus paper were placed to enable the progress of the gases to be followed. Solid fumigants applied as powders rarely fell deeper than 19 ins.; when they were used in balls they dropped to an average a depth of 19 ins., but occasionally reached 78 ins., or half the depth of a nest. Liquid fumigants tended to be absorbed by the soil. The gas produced by a solid or liquid remained localised. A heavy gas escaped by the nearest available opening if pumped in rapidly; if allowed to flow slowly it sank by the shortest way downward. Apart from losses in the sides of the galleries about 70 cu. ft. of gas was required to fill a nest. Gases of moderate weight that were blown in and dusts that yield gas when suspended in the air tended to escape by moving along the upper portion of the nest.

Wille (J.). **El gorgojo *Bruchus* de la semilla de alfalfa.** [The *Bruchus* Beetle infesting Lucerne Seed.]—*Bol. Direcc. Agric. Ganad. Peru* **5** no. 17 p. 135. Lima, 1935.

A species of *Bruchus* that oviposits on the pods of lucerne is now common throughout Peru. The larvae bore into the seeds, and the adults emerge from them about a month after they are stored.

Lamas Carreras (J.) & Colmenares (E.). **Informe sobre la visita de inspección á Huando, efectuada en marzo de 1934.** [Report on a Visit of Inspection to Huando in March 1934.]—*Bol. Direcc. Agric. Ganad. Peru* **5** no. 17 pp. 136–141, 4 figs. Lima, 1935.

The greater part of this article describes experiments with a lubricating oil emulsion against *Lepidosaphis beckii*, Newm., infesting

Citrus in Peru. As a result the formula recommended is 2 per cent. oil and 2 per mille soap. A fine spray should be applied at high pressure every 10–15 days until control is obtained. Scraping the trees is of value as a supplementary measure. *Papilio thoas*, L., was also found on *Citrus*. Peach and ash were infested by *Aulacaspis* (*Diaspis*) *pentagona*, Targ. Some cotton fields were fairly seriously attacked by *Anomis luridula*, Gn. (*texana*, Riley), against which an arsenical was used. About 25 per cent. of the larvae were parasitised by the Tachinid, *Eucelatoria australis*, Tns. [*cf. R.A.E.* A **22** 474].

Ritchie (A. H.). **Report of the Entomologist, 1934.**—*Rep. Dep. Agric. Tanganyika 1934* pp. 73–83. Dar-es-Salaam, 1935.

Stephanoderes hampei, Ferr., and larvae of the Tineid, *Setomorpha insectella*, F., were intercepted in Tanganyika during 1934 in coffee seed from the Belgian Congo, and the former in a commercial sample of coffee as well. Owing to scanty and irregular rainfall, coffee was seriously damaged by a Collembolan of the genus *Drepanocyrtus* and by *Coccus* (*Lecanium*) *viridis*, Green. The latter also attacked guava and *Citrus*, and *Tecoma stans* growing in gardens near infested coffee plantations. Its natural enemies included the fungus, *Cephalosporium lecanii*, which was observed in two areas but exerted little control, the Coccinellids, *Chilocorus adustus*, Wse., *C. discoideus*, Crotch, *C. angolensis*, Crotch, *Hyperaspis senegalensis*, Muls., and *Exochomus ventralis*, Gerst., and the Noctuids, *Eublemma costimacula*, Saalm., and *E. scitula*, Ramb. *Asterolecanium coffeae*, Newst., was recorded for the first time on coffee in Kilimanjaro. *Orthezia insignis*, Dougl., is becoming prevalent on *Coleus*, *Salvia*, etc., in one district and migrates from *Lantana* to neighbouring coffee. *Leucoptera daricella*, Meyr., accounts for 62 to 87·5 per cent. of the coffee leaf-miners, which have been very injurious; *Leucoptera coffeella*, Guér., which had been regarded as the prevalent species, comes next in importance. The Limacodid, *Niphadolepis alianta*, Karsch, was common on coffee in west Arusha. Parasites reared from coffee pests included *Metaphycus lounsburyi*, How., from *Asterolecanium coffeae*; *Paragus marshalli*, Bezzi, from *O. insignis*; and *Apanteles bordagei*, Giard, *Elasmus leucopterae*, Ferrière, *Pleurotropis* sp., *Chrysocharis* sp., *Atoposoma variegatum*, Masi, var. *afra*, Silv., *Trigonogastra* sp., *Cirrospilus* spp., and *Closterocerus* sp. from *Leucoptera* spp. Large numbers of weevils including *Systates pollinosus*, Gerst., and *Isaniris acuticollis*, Fst., damaged the margins of coffee leaves. Young plants can be sprayed with lead arsenate, and the adults, which during the day are found just beneath the soil near the base of the stems, should be collected and destroyed. The Coccinellids, *Ptatynaspis kollari*, Muls., and *P. capicola*, Crotch, were predacious on *Toxoptera aurantii*, Boy., which occasionally causes malformed growth of coffee. Coffee up to 2 years in age, the growth of which had been arrested by drought, was attacked by the Anthribid, *Phloeobius pustulosus*, Gerst., at or about ground level and destroyed. *Xyleborus morstatti*, Hag., was recorded for the first time on *Coffea arabica* in Kilimanjaro, and also on *C. robusta* in another area. *Anthores leuconotus*, Pasc., has been considerably reduced in numbers by rubbing the stems with Hessian cloth to remove rough bark and expose the tunnels of the young larvae. This also leaves a smooth surface in which the females find it hard to oviposit. *Dasus* (*Gonocephalum*) *simplex*, F., makes deep pits near

the ground in the bark of stems of coffee 2–3 years old and sometimes destroys the tree by ringing it. The pits are visited by two other Tenebrionids, *Zophosis agaboides*, Gerst., and *Rhytinota gracilis*, Gerst., and by *Cydnus lepidus*, Stål. Weeding should not be carried out in plantations infested with *D. simplex*, as the presence of succulent weeds prevents serious damage to coffee. Where permanent cover crops produce a heavy mulch of vegetable mould, this should be partly turned in and weeds like cowpeas, lupins, etc., should be grown as food for *Dasus*. Large numbers of Trypetids, especially *Ceratitis capitata*, Wied., were present in the coffee plantations, where the period of ripening of the fruit was lengthened by the dry conditions. Weekly applications of a bait-spray of 20 gm. sodium arsenite and 5 lb. sugar in 4 gals. water are recommended.

Sesbania sp., a temporary shade plant for young coffee, is damaged when 6–12 months old by larvae of *Argyroploce rhynchias*, Meyr., and *Cydia* (*Laspeyresia*) *phaulomorpha*, Meyr., which mine in the superficial tissues at the junctions of the branches and the stem and kill the plant by girdling the stem. The *Sesbania* should be planted at intervals of time, and as the older plants reach the susceptible age they should be cut down and used as green manure. Other pests attacking shade trees of coffee include the Lamiid, *Calothyrza bottegi*, Gestro, and the Aegeriids, *Idiopogon uranopla*, Meyr., and *Trilochana phaedrostoma*, Meyr., on *Cordia ovalis* ; *Ceroplastes* sp. (probably new) on *C. holstii* ; *C. zonatus*, Newst., and *Aspidiotus* (*Hemiberlesia*) *lataniae*, Sign., on *Pithecolobium saman* ; and *Lecanium* (?) *somereni*, Newst., *Pinnaspis chionaspiformis*, Newst., and the Saturniid, *Bunaea caffraria*, Stoll, on *Erythrina* sp. Stem-borers reared from wild food-plants of coffee pests were the Lamiid, *Opepharus spectabilis*, Perr., from *Croton megalocarpus*, the Curculionid, *Lixus bisulcatus*, Fst., from *Vernonia* sp., and the Cossid, *Azygophleps* sp., from *Cassia siamea*.

Predators found in stumps of sisal infested by *Scyphophorus acupunctatus*, Gyll. [*cf.* **23** 67] included *Hololepta scissoma*, Mars., *Hister geminus*, Er., and *Placodes ebeninus*, Lew. *Agave amaniensis* attracts *Scyphophorus* much more than sisal, and hybrid sisal plants showing the characters of *A. amaniensis* were regularly attacked. The Ichneumonid, *Mesochorus nigellus*, Wlkn., was reared from the larvae of the Lymantriid, *Notolophus* (*Orgyia*) *vetustus*, Hmpsn., which seriously damaged the foliage of geranium. The Coccinellids, *Cryptolaemus montrouzieri*, Muls., and *Rodolia cardinalis*, Muls., were introduced from South Africa together with local species of *Chilocorus* into kapok plantations that had been severely damaged by *Phenacoccus iceryoides*, Green. Although cotton was attacked from mid-May to mid-June by *Heliothis obsoleta*, F., there was no loss of crop. *Prodenia litura*, F., caused an appreciable loss of newly-planted tobacco. Maize planted at the optimum time suffered little from *Busseola fusca*, Fuller, but that planted late was severely attacked by it and by *Peregrinus maidis*, Ashm. Greater attention to the satisfactory disposal of crop residues is advised. The Lamiid, *Sthenias cylindrator*, F., was reported girdling the stems of young tung oil plants (*Aleurites* spp.). Coconuts were severely attacked by *Cerataphis lataniae*, Boisd., in one area, and peach trees were defoliated by the Galerucid, *Mimastroides usambarica*, Wse. *Physothrips* sp. caused sterility of the flowers of lima beans (*Phaseolus lunatus*), having probably migrated from wild leguminous plants. *Entypotrachelus meyeri*, Klbe., attacked the leaves of *Crotolaria* spp. grown for green manure. Forest regeneration was

greatly retarded by the larvae of the Buprestid, *Sphenoptera sublevis*, Kerr., which feed in the tap roots of *Afzelia quanzensis* and work up inside the stem to just above ground level to pupate.

HARRIS (W. V.). **Report of the Assistant Entomologist, 1934.**— *Rep. Dep. Agric. Tanganyika 1934* pp. 84–89. Dar-es-Salaam, 1935.

Pests of coconuts in Tanganyika included *Decadarchis minuscula*, Wals., *Diocalandra frumenti*, F., which bored in the husks of green nuts, *Ceroplastes stellifer*, Ldgr., and the Derbid, *Diostrombus abdominalis*, Dist. Many Lamiids of the genus *Sophronica* were found feeding on dried coffee fruits in Bukoba. The injury caused to the bean by the beetles eating the dried pulp can be avoided by harvesting early and hulling the fruits before storing. *Stephanoderes hampei*, Ferr., increased on *Coffea robusta* in Bukoba during 1934, and the percentage of damaged fruit varied from 5 to 57 during May. Two parasites reared from it were provisionally identified as *Prorops nasuta*, Wtstn., and *Heterospilus coffeicola*, Schmied. *Isaniris centropus*, Mshl., was reported feeding on the foliage of coffee. The average number of *Platyedra* [*gossypiella*, Saund.] to 100 locules of cotton in one district in September 1934 was only 1 as compared with 5 in 1933. This reduction may have been due to the abnormally low rainfall between August 1933 and March 1934. The spiny bollworm (*Earias*) was observed to breed on *Abutilon angulatum* and *A. mauritianum* and to fly to cotton. Branches bored by *Apion xanthostylum*, Wagn., were broken off in high winds, and the resultant wounds allowed termites to enter. A weevil damaging the cotyledons has been identified as *Goniorrhinus terrenus*, Mshl. The average percentage of bolls damaged by cotton stainers [*Dysdercus*] was 45·9 but this was not in proportion to the number of bugs present. *Nezara* spp. and *Calidea bohemani*, Stål, which were unusually numerous, experimentally produced stained locules and prevented the bolls from opening.

Pests recorded from *Sesamum indicum* include *Phacemastrix picta*, Hesse, the larvae of which bored in the stems and caused the plants to die; *Sphrigodes crinitus*, Mshl., and *S. globulus*, Mshl., which fed on the leaves; and *Lycidocoris mimeticus*, R. & P., which had only been known as a pest of coffee. *S. globulus* and *Systates alticollis*, Mshl., also defoliated ground-nut [*Arachis hypogaea*]. The attacks of *Pseudococcus brevipes*, Ckll., on the developing pods of ground-nut caused the outer layers to decay. The Anthomyiid, *Atherigona indica*, Mall., previously known from southern India, is recorded for the first time in Tanganyika. The second crop of early maturing *Sorghum* was chiefly attacked and the hearts destroyed. In experiments, derris preparations gave complete control. Grain crops were injured by *Busseola fusca*, Fuller, which preferred maize to *Sorghum* or bulrush millet (*Pennisetum spicatum*). The leaves of lima beans (*Phaseolus lunatus*) were attacked by *Systates minimus*, Mshl. *Apate indistincta*, Murr., which has previously only been known on wild almonds, has now been taken on cultivated ones. Young *Eucalyptus* trees were seriously defoliated by the Galerucid, *Megalognatha lamaticornis*, Lab., and potatoes by *Epicauta nyassensis*, Haag., which is common on wild solanaceous plants. On one coffee estate the establishment of *Indigofera endacaphylla* as a cover crop was hindered by the Chrysomelid, *Phaedonia areata*, F., which attacked the foliage. Experimental plots

of *Boehmeria utilis* were attacked by the larvae of *Acraea jodutta*, F., and *A. pharsalus*, Ward. Spraying with lead arsenate gave satisfactory control. The larvae of *A. acerata*, Hew., defoliated sweet potato in north-western districts. Peppermint was severely injured by a Tingid, *Monanthia* sp. near *globulifera*, Wlk., and a root-feeding Coccid. The latter was controlled by soil fumigation with paradichlorobenzene (4 oz. per sq. yd.) and by planting new areas with roots fumigated with carbon bisulphide. The Tingid was apparently controlled with pyrethrum sprays, but re-infestation was rapid, although no other food-plants have been found.

Notes are given on the movements of locust swarms in 1934. *Locusta migratoria migratorioides*, R. & F., was not very abundant, but the whole territory was seriously involved in the large-scale northerly breeding migration of *Nomadacris septemfasciata*, Serv., which began in December 1933. In areas where the rains were unusually prolonged, many hoppers of this species were killed by the fungus, *Empusa grylli*. A large number of egg-masses were destroyed by *Stomatorrhina lunata*, F., and *Scelio howardi*, Crwf., was reared in numbers from parasitised eggs in one locality.

GARCIA TEJERO (F. D.). **La " cuca " de los alfalfares** (*Colaspidema atrum*, **Oliv.**). [*C. atrum* in Lucerne Fields.]—*Econ. Téc. agríc.* **4** no. 39 pp. 219–220, 2 figs. Madrid, July 1935.

The Chrysomelid, *Colaspidema atrum*, Ol., sometimes destroys the first two mowings of lucerne in Spain. The adults emerge from the ground in early spring, and pair and oviposit in the lucerne fields. A female lays about 400 eggs, cementing them to the leaves and stems. The first larvae appear before all the adults have died. After about a fortnight, the larvae penetrate deep into the ground and remain inactive for about a month before pupating. The pupal period requires about 12 days, but the adults remain in the ground until the following spring, when they feed on the young leaves. The attack is continued with such intensity by the larvae, which are most active before the second mowing, that the whole of the leaves except the mid-ribs are sometimes devoured. The pupal stage appears to be the most sensitive to unfavourable weather, particularly to great humidity. Many larvae can be starved to death by delaying the first mowing until they appear. As a supplementary measure, the newly mown field may be dusted with slaked lime and harrowed. Strips of lucerne can be left uncut to serve as traps. Fields can be protected by mowing a belt around them and dusting it. Young plants can be effectively treated with dusts or sprays of calcium arsenate.

[SKOBLO (I. S.).] **Скобло (И. С.). The Influence of intermittent Starvation on the Development of the Larvae of the Meadow-moth** (*Loxostege sticticalis* **L.). Preliminary Communication.** [*In Russian.*]—*Zool. Zh.* **14** no. 1 pp. 159–170, 11 refs. Moscow, 1935. (With a Summary in English.)

A tabular statement is given of the results of laboratory experiments in the Department of Astrakhan during the summer of 1933 on the effect of interrupted starvation on larvae of *Loxostege sticticalis*, L. Larvae of the fifth instar that were allowed to feed on orach [*Atriplex*]

for only 12, 4 and 2 hours a day completed development in averages of 79·2, 128 and 229·5 hours, respectively, as compared with the normal average of 60 hours. About half those that fed for only 2 hours out of 24 pupated, and the resulting adults laid viable eggs after supplementary feeding. When larvae were deprived of food for 12 hours a day commencing with the third, fourth or fifth instar, the duration of the development of the fifth instar was longer the earlier the larvae were subjected to intermittent starvation. Similar interruptions in feeding in a single instar prolonged the third and fifth instars by 104 and 31 per cent., but slightly shortened the fourth instar. The quality of the food also appeared to affect the duration of the development, as the fifth instar in larvae fed uninterruptedly on wormwood (*Artemisia maritima*) took 101 hours as compared with 60 in those fed on orach, and fifth instar larvae fed on wormwood for 16 hours a day, developed far more slowly than those fed on orach for 12 hours. The weight of the pupae was 29, 39 and 59 per cent. lower than normal when the larvae were deprived of food for 12 hours daily from the beginning of the fifth, fourth and third instars, respectively. Pupae from larvae fed on orach were heavier than those from larvae fed on wormwood. There was no direct relation between the amount of excreta ejected by the larvae and the weight of the pupae. As a result of protracted development, most of the food consumed is not accumulated in the organism but is used in metabolism, and larvae that had ejected the largest amount of excreta produced the smallest pupae.

[Shtakel'berg (A. A.).] **Штакельберг (А. А.). Les mouches de la partie européenne de l'URSS.** [*In Russian.*]—*Tabl. anal. Faune URSS* no. 7, 742 pp., 309 figs. Leningrad, 1933. Price 22 *r.* 50 *kop.*; binding 2 *r.* 50 *kop.* [Recd. October 1935.]

This work, to which 3 specialists besides the author have contributed, comprises keys to the families, genera and species of the Diptera, other than Nematocera, of European Russia. It deals with 60 families and about 3,000 species, which include the more common and widely distributed species occurring in adjoining countries. Brief notes on the bionomics of some genera and of most of the families are also given. Introductory sections include brief general information on Diptera, a discussion of the economic importance of beneficial and injurious flies and the relation between systematic and applied entomology, and notes on morphology. There is an index to the families, genera and species.

[Lebedev (A. G.).] **Лебедев (А. Г.). On the Utilisation of the Sexual Impulse of Insects for Control.** [*In Ukrainian.*]—*Rech. Écol. Anim. terr.* **2** pp. 3–18, 6 refs. Kiev, Vidavn. Vseukr. Akad. Nauk, 1935. (With Summaries in Russian pp. 12–15, and English pp. 15–18.)

Experiments on a small scale were made in the summer of 1926 near Kiev, to see if it would be possible to use the attraction of females of *Porthetria* (*Lymantria*) *dispar*, L., for trapping and destroying the males [*cf. R.A.E.*, A **19** 493; **21** 459]. The tips of the abdomens of 20 females were removed and exposed as pulp on a glass plate in the open. The males appeared in a few minutes, but the material remained attractive for only about 15 minutes, probably because of desiccation

and evaporation. An extract of whole abdomens prepared with normal saline had only a very slight attraction when fresh, and if prepared overnight, had no effect whatever. Females deprived of the abdomen but still alive, failed to attract the males. These experiments indicate that the males are not guided to the females by sight, that the glands containing the attractant are only situated in the intersegmental fold of the last abdominal segments of the female, and that their secretion is very volatile. During the peak of the flight of the moth, 376 males were caught in 4 hours, between 11 a.m. and 3 p.m., in a dish of water on which was a cage containing 30 living females.

In July 1929 comparable results had been obtained from experiments with *Dendrolimus pini*, L. Cages with unfertilised females were placed in different parts of a forest, and males were caught in traps fixed to or near them. Of marked males released at various distances from the cages, some flew over 230 yards, and one came from a distance of 280 yards though the wind was blowing across the line of its flight, which was obstructed by buildings and tall trees. Although males can probably detect the scent of the females only at short distances, they may cover quite large areas in search of them. The author discusses in some detail possible methods of applying these data to control. Unmated females attract males during at least a week, and the effective range of a trap will increase in inverse proportion to the numbers of free females in the field.

[Lebedev (A. G.).] **Лебедев (А. Г.). Materialien zur Erforschung der Biozenose des Laubwaldes.** [Materials for the Study of the Biocoenosis of a deciduous Forest.] [*In Ukrainian.*]—*Zbirn. Pratz' Sekt. Ekol. nazemn. Tvar.* pt. 1 pp. 51–78, 8 refs. Kiev, Vidavn. VUAN, 1933. [Recd. September 1935.]

[Lebedev (A. G.).] **Лебедев (А. Г.). Material for the Study of Biocoenosis in foliate Forests, pt. ii.** [*In Ukrainian.*]—*Rech. Écol. anim. terr.* no. 2 pp. 19–55, 6 refs. Kiev, Vidavn. Vseukr. Akad. Nauk, 1935. (With Summaries in Russian pp. 52–53, and English pp. 53–55.)

In the first paper an account is given of attempts made in 1931 and 1932 in a deciduous forest near Kiev to determine the insect population with special reference to the larger moths by using a light trap designed by Sakharov [*R.A.E.*, A **16** 151]. In 1931 with a 75-watt lamp, 4,842 moths of 11 different families were caught on 150 nights; in 1932 with a 200-watt lamp, 9,691 moths were caught on 160 nights.

Lists of the species of moths taken in the two years are given, showing the months of capture, the number of individuals, and which species have not previously been recorded from the locality. Brief notes on the abundance of insects of other orders captured are given.

The second paper opens with a discussion of the interrelations between animals and plants. The light trap experiment was continued in the same forest in 1933, a 200-watt lamp being used. During 182 nights 4,601 moths were captured, less than half as many as in 1932. This decrease in numbers was due to unusually wet and cold weather during almost the whole vegetative period in 1933. Of the species taken in the preceding two years, 132 (about a third of the total number) had disappeared; on the other hand, 24 species

that did not occur in 1931–32 were taken, of which 8 were new to the district. Lists are given of the moths taken in 1933, and of the Coleoptera, comprising 43 families, taken in 1931 and 1932.

[Rudnev (D. F.).] **Руднев (Д. Ф.). Methoden zur Feststellung der Befallstärke der Kieferneule** (*Panolis flammea* **Schiff.).** [Methods of determining the Intensity of the Infestation by the Pine Noctuid, *P. flammea*.] [*In Ukrainian.*]—*Rech. Écol. Anim. terr.* no. 2 pp. 57–134, 2 figs., 5 diagr., 3 graphs, 1 fldg. pl., 20 refs. Kiev, Vidavn. Vseukr. Akad. Nauk, 1935. (With Summaries in Russian pp. 130–134, and German pp. 259–263.)

After a severe and widespread outbreak of *Panolis flammea*, Schiff., in pine forests in the Department of Kharkov in June 1930, the pupae occurring in the soil of sample plots in different parts of the forest were counted during the summer and autumn in order to determine the degree of infestation and to locate the main breeding foci. The moth was found to be confined to pure, or almost pure, pine stands of the dry and fresh types; in the former type the ground water occurred at a depth of about 20 ft. and in the latter at 7–13. In infested stands the pupae were most numerous in the densest parts of the forests. Uncleared dry stands of artificially planted pines from 10 to 25 years old were most heavily infested. Pupae were also abundant in stands up to 60 years old, rarer in older stands and practically absent in very young ones. Where infestation was highest, pupal mortality varied from 15 to 40 per cent., in spite of a considerable number of parasites and diseases, whereas in slightly infested parts, although the absolute number of parasites and diseases was small, mortality ranged from 60 to 100 per cent. The parasites included *Ichneumon pachymerus*, Htg., *Banchus femoralis*, Thoms., *Enicospilus merdarius*, Grav., and Chalcidoids. Ichneumonids predominated on the periphery of the breeding foci, where infestation was slight, but in the centre they were almost superseded by fungi and bacterial diseases and to a less extent by Chalcidoids. In the spring of 1931 the spread of disease had raised the rate of pupal mortality by 17–22 per cent. in the centre of the foci, and by 10 per cent. on the periphery. The moths were on the wing from 22nd April till 15th May. A few days before beginning control measures, the healthy and diseased eggs on branches cut from sample trees were counted, and the amount of needles available was estimated by picking and weighing them; the percentage of the possible damage in the next outbreak was calculated from these data by a formula given.

Aeroplane dusting with calcium arsenite applied in bands 98 ft. wide at 7 lb. per acre was started on the 26th May. The rate of mortality was calculated by counting the dead larvae that dropped from sample trees, the surviving larvae in the crown after these trees were cut down, and the number of larvae that had entered the soil and pupated during dusting, which was protracted by rain and other interruptions until 22nd June. Plots in which the infestation was high and the amount of needles comparatively small were dusted twice. On an average, over 80 per cent. of the larvae were killed, and in some plots the mortality was 95–100 per cent. In the untreated parts of the forest 15–25 per cent. of the larvae died from natural

causes, chiefly diseases. At the end of summer and beginning of autumn only a negligible number of pupae were found in the soil over the 13 sq. miles of forest that had been treated.

[Levitt (M. M.).] **Левітт (M. M.). Variability of Pupae and of the Fecundity of Adults of the Gypsy Moth** (*Porthetria dispar* **L.).** [*In Ukrainian.*]—*Rech. Écol. Anim. terr.* no. 2 pp. 135–170, 20 refs. Kiev, Vidavn. Vseukr. Akad. Nauk, 1935. (With Summaries in Russian pp. 165–167, and English pp. 168–170.)

A detailed account is given of laboratory investigations in Kiev on variation in the rate of egg production in *Porthetria dispar*, L., in the years 1932 and 1933. The material consisted of 132 pupae reared from eggs from the Crimea, the larvae being fed on oak and hornbeam [*Carpinus*], and of 848 pupae collected in orchards and a deciduous forest near Kiev from trees in which the percentage of leaves destroyed varied from less than 5 to 100. The pupae were measured, weighed and kept singly in cages containing apple branches; the moths that emerged were paired, and the eggs were counted and in many instances weighed. The relation between the length and width of the pupae and their weight, and between each of these characters and the fecundity of the resulting adults was calculated; the mathematical method is discussed and the results shown in tables. Each character tended to vary with the condition of feeding; fluctuation in fecundity was very marked, pupal weight varied less, and changes in pupal length and width were comparatively slight. The coefficient of variability was higher when the larvae had fed under unfavourable conditions. An increase in size and weight of pupae resulted in a greater production of eggs, so that it is possible on the basis of this correlation to predict the potential fecundity of the moths and the extent of an impending infestation. Pupae from severely damaged trees, on which the larvae were more or less crowded, weighed less than those from slightly infested trees. The weight of the pupae and the number of eggs laid by the resulting moths were in inverse ratio to the degree of injury by larval feeding.

Parasites obtained from some pupae collected at Kiev and separated from the healthy ones used in the investigations were *Zenillia libatrix*, Panz., *Compsilura concinnata*, Mg., *Tachina* (*Larvaevora*) *larvarum*, L., *Phryxe vulgaris*, Fall., *Lydella nigripes*, Fall., *Sarcophaga* (*Pseudosarcophaga*) *affinis*, Fall., and *Muscina* (*Musca*) *stabulans*, Fall. The last had oviposited and developed in pupae that had already been killed by Tachinids.

[Levitt (M. M.) & Ivanov (S. P.).] **Левітт (M. M.) і Іванов (С. П.). On Fecundity in Insects as related to some Objects of Ecology and practical Entomology.** [*In Ukrainian.*]—*Rech. Écol. Anim. terr.* no. 2 pp. 171–191, 61 refs. Kiev, Vidavn. Vseukr. Akad. Nauk, 1935. (With Summaries in Russian pp. 189–190, and English pp. 190–191.)

The following is based on the authors' summary: This paper is a preliminary discussion of the relation between knowledge of the variability and physiology of fecundity in animals, and particularly in insects, and economic zoology and entomology, with special reference to the study of the ecology of pests and the prediction of

outbreaks. As the facts of insect genetics, physiology, ecology and field experience have not been properly brought together as a basis for economic entomology, the authors point out the need for systematic and statistically sound methods of gathering and evaluating data, and the need for better methods of ecological physiology and for systematising these data on the basis of evolutionary theory. The importance of correlating the study of genetics and that of ecology is emphasised. The more important literature dealing with the fertility of insects is reviewed, the various points discussed including : the conception of potential, presumable and actual fecundity, especially in view of experiments on *Drosophila* ; the effects on egg production of such factors as nutrition, starvation, regeneration feeding, restricted space, physiological phenomena, etc. ; pathological sterility and its connection with micro-organisms, fungi, etc. ; the direct influence of environment on the reproductive system ; and the connection between the size of the pupae and the fertility of the adults.

[Ivanov (S. P.).] **Іванов (С. П.). On the Action of Man upon the Fauna of injurious Animals.** [*In Ukrainian.*]—*Rech. Écol. Anim. terr.* no. 2 pp. 192–212, 44 refs. Kiev, Vidavn. Vseukr. Akad. Nauk, 1935. (With Summaries in Russian pp. 210–211, and English pp. 211–212.)

This is a general discussion, largely supported by data from the literature, on the effect of the activity of man on the fauna of wild or cultivated areas. Owing to unintentional selection by man, there arises in specialised injurious species a high degree of adaptability to the conditions under which cultivated crops are grown. The increase of these pests is not due merely to man's destruction of their natural enemies or to the upsetting of particular biotic conditions, as is commonly believed, but rather to the creation of the most favourable conditions for a series of species by changing the whole environment. The only way to overcome this disadvantageous selection is to inaugurate and apply a properly controlled and complete system of economic and agricultural as well as merely destructive measures over a very large portion of the area of the distribution of the species.

[Bilanovs'kiĭ (I. D.).] **Білановський (І. Д.). The biological Method of controlling noxious Insects.** [*In Ukrainian.*]—*Rech. Écol. Anim. terr.* no. 2 pp. 213–257, 69 refs. Kiev, Vidavn. Vseukr. Akad. Nauk, 1935.

This paper is a review of the literature on the biological control of insect pests. The relative value of insect parasites and predators is discussed, and a list of parasitic families of Diptera and Hymenoptera is given with general indications of their hosts. Other sections deal with the relations between the parasite and the host and their dependence on environment ; the use of vertebrates in the control of insect pests ; the bionomics of various groups, families and species of parasitic and predacious insects ; symptoms of parasitism in a host and the number of parasites that may develop in it ; the economic importance of Tachinids as parasites ; parasitic and predacious insects other than Tachinids and Hymenoptera ; and the methods and technique of biological control.

[Lozina-Lozinskiĭ (L. K.).] **Лозина-Лозинский (Л. К.). Die Anabiose bei den Raupen der *Pyrausta nubilalis* Hübn. nach Gefrierung.** [Anabiosis in the Larvae of *P. nubilalis* after Freezing.] [*In Russian.*]—*C. R. Acad. Sci. URSS* 1935 **2** no. 3–4 pp. 328–332, 15 refs. Leningrad, May 1935. (With a Summary in German.) [Recd. August 1935.]

An account is given of experiments in Russia in the winter of 1934–35 on anabiosis in the hibernating fifth instar larvae of *Pyrausta nubilalis*, Hb. The author defines anabiosis as a state in which an insect is not killed by the freezing of free water in its body [*cf. R.A.E.*, A **23** 564, etc.]. Hibernating larvae from stems of hemp were subjected to temperatures of −11·2°C. [11·84°F.], −21·2°C. [−6·16°F.] and −30°C. [−22°F.] for various periods and in different months, and then transferred to a temperature of 14–16°C. [57·2–60·8°F.]. The numbers of larvae that froze (turning hard and brittle) and that did not freeze (remaining soft) and the percentage of survival in both cases after thawing, which varied from 62·5 to 100 even in frozen larvae, are shown in a table. The larvae began to be active in 30–40 minutes after exposure to 14–16°C., and in an hour re-entered the stems of hemp and made cocoons. At −21·2°C. about 60 per cent. of the larvae became frozen and stiff, but were viable even after remaining in this state for 8 days. The cold-hardiness of the larvae, the freezing point of which varies from −3·75°C. [25·25°F.] to −5·75°C. [21·65°F.] with an average of −5°C. [23°F.], is connected with the high osmotic pressure of their tissues. The fact that at −11°C. [12·2°F.] the larvae did not become completely hard, indicates that freezing is incomplete because some of the fluid in the tissues and cavities becomes concentrated and cannot turn to ice at that temperature. Cold-hardiness is, however, lost as soon as the larvae are exposed to an atmospheric humidity of 100 per cent. at a temperature of 22°C. [71·6°F.] or higher. Of larvae kept under these conditions for 2–7 days and then exposed for 30 minutes to low temperatures, 80–83 per cent. died at −21·2°C., and somewhat smaller percentages at −11°C. and −4°C. [24·8°F.]. This is probably due to absorption of water by the larvae and the beginning of hystolysis [**23** 613]. They are killed by low temperature owing to disturbance in metabolism, which is intensified in the course of development. In the life-cycle of *P. nubilalis* a state of anabiosis can only occur during the diapause.

[Smirnov (E. S.).] **Смирнов (Е. С.). Verzeichnis der Schädlinge der öffentlichen Gärten von Moskau.** [Pests of Public Parks in Moscow. (*In Russian.*)].—*Abstr. Works zool. Inst. Moscow St. Univ.* no. 2 pp. 123–128, 4 refs. Moscow, 1935. (With a Summary in German.)

A list is given of the insect pests found on trees and shrubs in public gardens and squares in Moscow in 1932. Among the more injurious were: the Coccids, *Lepidosaphes ulmi*, L., and *Chionaspis salicis*, L., which chiefly occurred on ash and lime [*Tilia*], respectively; the Aphids, *Anuraphis crataegi*, Kalt., on hawthorn [*Crataegus*], and *Aphis pomi*, DeG., on apple, hawthorn, lilac, etc.; the Scolytids, *Hylesinus* (*Leperesinus*) *fraxini*, Panz., on ash, *Scolytus scolytus*, F., on

elm, and *S. ratzeburgi*, Jans., on birch; the Tineids, *Lithocolletis populifoliella*, Tr., which occurred in enormous numbers on poplars [*cf. R.A.E.*, A **23** 105], and *Gracilaria syringella*, F., which was very common on lilac and produced two generations in the year, the pupae of the second hibernating in the soil; the Tortricid, *Enarmonia* (*Semasia*) *minutana*, Hb., which was abundant on poplars in the spring; and the Lymantriid, *Stilpnotia salicis*, L., on poplars and willows. An Agromyzid of the genus *Phytomyza* sometimes infested 75 per cent. of the leaves of yellow acacia [*Caragana*]. It hibernated in the pupal stage in the soil. Many of the larvae were parasitised by the Eulophid, *Solenotus viridis*, Först.

The only injurious mite was *Tetranychus tiliarius*, Herm. (*telarius*, auct.), which was very abundant on the foliage of lime and had several generations a year. The adults hibernated in the bark and resumed activity in May.

[Rekk (G. F.), Vashadze (V. N.) & Makharashvili (P. D.).] **Рекк (Г. Ф.), Вашадзе (В. Н.) и Махарашвили (П. Д.). Testing Mineral Oil Emulsions for the Control of Orchard Pests. Report for the Year 1932–33.** [*In Georgian.*]—*Trud. zonal'n. Sta. plod. Khoz.* no. 2, 25 pp., 11 refs. Tiflis, 1935. (With Summaries in English and Russian.)

The following is based on the summary: An account is given of field and laboratory experiments in Georgia in the summer and autumn of 1932 and 1933 with emulsions of solar oil and to a less extent lubricating oil against insect pests of fruit trees. The results are shown in tables. The emulsifying agents used were soap, Bordeaux mixture, and ferrous sulphate with lime.

All eggs of *Cydia pomonella*, L., were killed by either oil at concentrations ranging from 0·5 to 2 per cent. (and by solar oil even at 0·25 per cent.), when sprayed in the insectary or on isolated apple branches in the orchard. In insectary tests against eggs and young larvae of the apple moth, *Hyponomeuta padellus malinellus*, Zell., under their protective shields, 0·25–2 per cent. concentrations of either oil killed all the eggs, but higher concentrations were required for the larvae. On pear in the orchard, 75 per cent. of the nymphs and 46·3 per cent. of the adults of *Stephanitis pyri*, F., were killed by 2 per cent. solar oil. At 0·5–2 per cent., this oil killed 95–100 per cent. of the larvae of *Psylla* sp. in the laboratory. In small scale tests against Aphids the rate of mortality did not exceed 30–40 per cent. None of the emulsions caused any damage to the trees.

[Arkhangel'skaya (A. D.).] **Архангельская (А. Д.). The Carmine-producing Coccids (*Margarodes*) of Middle Asia and Species of an allied Genus *Neomargarodes*.** [*In Russian.*]—36 pp., 7 figs., 24 refs. Tashkent, Izd. Komit. Nauk UzSSR [Pub. Com. Sci. Uzbek SSR], 1935. Price 1 *rub.* 10 *kop.* (With a Summary in English.)

This paper opens with brief notes on the economic importance, distribution and food-plants of the cochineal insect, *Dactylopius coccus*, Costa (*Coccus cacti*, auct.), and the possibility of introducing it into the Russian Union, and on the Coccids of the genus *Margarodes*, of which *M. polonicus*, L., used to be common in south-western

Russia, and *M. hameli*, Brandt, has been found in Armenia [*R.A.E.*, A **22** 170].

Descriptions are given (in Russian and English) of all stages of the following new species of the genera *Margarodes* and *Neomargarodes*, of which the former were found in Uzbekistan: *M. odorata* on stems and branches of *Dianthus crinitus* and *Acanthophyllum spinosum*; *M. sophorae* on roots of *Sophora alopecuroides* and *Glycyrrhiza* sp.; *M. cynodontis* on stems and shoots of *Cynodon dactylon* and *Aeluropus littoralis*; *M. arnebiae* on roots of *Lapulla* sp. and *Arnebia guttata*; *M. nuda* on *Festuca* sp. close to the roots; *N. festucae* on roots of *Festuca* spp. in the district of Odessa; and *N. chondrillae* on roots of *Chondrilla* sp. in Kazakstan. Keys are given to the species of *Margarodes* and *Neomargarodes* in the Russian Union, and brief notes on the bionomics of the 7 new species, and of *N. erythrocephala*, Green, taken near Samarkand on roots of *Ruta hirsuta*, and *N. trabuti*, Marchal, in Turkmenistan on *Aristida pennata*.

Only *M. odorata*, *M. sophorae* and *M. cynodontis* are common enough in Central Asia to be of importance as a possible source of cochineal. Their bionomics are similar. The male larvae of *M. odorata* abandon their cysts [*cf.* **7** 136] at the beginning of August, and the adult females do so 7–10 days later. After a short prepupal stage, the male larvae pupated in sand in light cocoons. The pupal stage lasted 7–13 days. The males fly little. They die on the day they pair, but if isolated from females, lived 3 days or more. Unfertilised females become motionless and are covered with a white waxy down, in which state they may remain alive for several months, or even years [*cf. loc. cit.*]. If pairing takes place, the females become covered with wax on the following day and begin to oviposit 2–3 days later. In the course of oviposition the female becomes smaller and at last shrivels and dies. The number of eggs in a female may vary from 50 to 300. In the laboratory, the egg stage lasted 4–5 weeks. In the field, first instar larvae hibernated, and moulted in spring; the second and third instars, enclosed in cysts, developed from April to the end of July on the roots as well as the overground parts of the food-plant. Instances of diapause were observed. The male larvae of *M. sophorae* begin to abandon their cysts about mid-August, and, after 2–3 days, rest as prepupae for 5 days and as pupae for 7–9 days. The females appear from the cysts in the second half of August and oviposit 2–3 days after pairing. Unfertilised females lived 7 months or longer. The larvae hatch in 4 weeks and hibernate in the first instar. The roots of the food-plant are infested at a depth of 4–6 ins. The male larvae of *M. cynodontis* leave their cysts in late July or the first half of August, but the adult females continue to appear till mid-September. In the laboratory, the prepupal stage of the males lasted 8–9 days, and the pupal 12–14. Isolated males lived 5–10 days. Oviposition continued throughout September and the eggs took a month to hatch. The best time to collect the insects is 10–15 days before they begin to abandon their cysts and enter the soil. They should be killed with a poison, either in or out of their cysts, and then dried.

HAINES (G. C.). **The Harvester Termite.**—*Fmg in S. Afr.* 1935 reprint no. 47, 2 pp., 2 figs. Pretoria, June 1935. [Recd. August 1935.]

Much of this information on harvester termites (*Hodotermes* spp.) in South Africa has been noticed from a more detailed account

[*R.A.E.*, A **23** 377]. Although primarily of importance as pests in the open veldt, they also cause damage to cereals, garden plants, haystacks, etc., and, if they gain access to buildings, may destroy thatch or wallpaper, though they cannot attack wood. The difficulty in locating the nests, their depth, and the length and narrowness of the tunnels, make ordinary methods of control impracticable. Poison baits of finely chopped forage soaked in solutions of either sodium fluoride (26 oz. in 8 gals. water) or sodium arsenite (1 lb. in 8 gals., with or without the addition of 1 gal. treacle or 8 lb. sugar) are the most effective methods of exterminating the colonies. The baits, which are best used dry, should be spread thinly at the rate of 10 lb. per acre where and when the termites are working. As a repellent, a carbolic dip (one teacupful in 4 gals. water) or copper sulphate ($\frac{1}{2}$ oz. in 4 gals.) may be applied to the holes in gardens and lawns, or to the walls and floors of buildings.

Hosni (M.) & Shafik (M.). **A Mealy Bug new to Egypt** (*Pseudococcus brevipes*, **Ckll.**) **on Roots of** *Phoenix* **sp. and its Control by the Application of Chemicals to the Soil.**—*Bull. Minist. Agric. Egypt* no. 159, 8 pp., 3 pls., 13 refs. Cairo, 1935.

Pseudococcus brevipes, Ckll., was first observed in Egypt, on the roots of *Phoenix* in pots, in 1932. The adult female is described. A control experiment was carried out in October, using orthodichlorobenzene, paradichlorobenzene, naphthalene, seekay (a proprietary preparation containing ortho-, para- and meta-dichlorobenzene), and mercurous chloride (calomel). The infested plants were re-potted with known amounts of insecticide distributed round them. Mercurous chloride ($\frac{1}{2}$ oz. to 1 gal. water) was applied before repotting in sufficient quantity to wet the soil enclosing the plant. All the fumigants gave 100 per cent. mortality at the rate of 10 gm. or cc. per plant, and all did so in some tests at the rate of 2 gm. or cc. Ortho- and paradichlorobenzene acted more quickly than seekay or naphthalene. Mercurous chloride gave quick results, killing all the mealybugs and having no deleterious effect on the plants, even when they were watered with the solution.

Hall (F. W.). **Report of the Department of Agriculture (Gambia) for the Period ending 31st May, 1935.**—Fol., 16 pp. Bathurst, 1935.

Heliothis obsolcta, F., *Prodenia litura*, F., and *Empoasca facialis*, Jac., were recorded damaging cotton, the last-named causing leaf-curl of native cotton only. Although *Dysdercus* spp. were present, they were not observed on cotton.

Takahashi (S.). **Experimental Studies on the Causes of Heat in stored Grains produced by Insect Pests.** [*In Japanese.*]—210 pp. Tokyo, The Author, December 1934.

A rise in temperature, sometimes to 30–35°C. [86–95°F.], is produced in stored rice when infested by *Calandra sasakii*, Tak., and is independent of air temperature. The temperature rises perceptibly when over 1,000 insects are found per 300 gm. [10$\frac{1}{2}$ oz.] of rice and reaches its maximum 12 days after the larvae hatch, when their body

temperature and respiration rate are highest. Other stored cereals are also heated by insects, and the grains cool if the insects are killed by fumigation or vacuum [*cf. R.A.E.*, A **20** 645; **22** 129, etc.]. The heat is produced by larvae and not by adults.

YAGI (M.). **On the Method of controlling** *Crossocosmia sericariae* **by Supersonic Waves.** [*In Japanese.*]—*J. seric. Sci.* **6** no. 3 pp. 194–204, 1 pl., 2 figs. Tokyo, August 1935.

The larvae of *Sturmia* (*Crossocosmia*) *sericariae*, Rond., in the silkworm [*Bombyx mori*, L.] are killed by supersonic waves (450 kilocycles), but these do not injure the hosts. The waves are most effective when the larvae are located at the spiracles of the host pupae, and they are killed by exposure for 10 minutes within 3–4 days after the hosts pupate, or for 20–30 minutes subsequently. The hosts are also injured, however, if treated just before the moths would emerge.

HIROSE (K.). **On the Biology of** *Tenebrio obscurus* **F.** [*In Japanese.*] —*Insect World* **39** no. 9 pp. 323–324. Gifu, September 1935.

In central Japan, the adults of *Tenebrio obscurus*, F., occur from May to July. They live for 20–30 days. The eggs hatch in 10–12 days. Most of the larvae pupate in the following spring, but some take two years to mature. The adults and larvae feed on both raw and boiled rice.

KOJIMA (T.). **Effect of Temperature and Moisture upon the Hatching of** *Dendrolimus spectabilis* **Butl.** [*In Japanese.*]—*Oyo-Dobuts. Zasshi* **7** no. 5 pp. 211–224. Tokyo, September 1935.

At a relative humidity of 70–100 per cent. some eggs of *Dendrolimus spectabilis*, Butl., hatched when kept at constant temperatures of 14·4 or 33·2°C. [57·74 or 91·76°F.], and over 95 per cent. hatched when kept at temperatures between 16 and 32·2°C. [60·8 and 89·96°F.].

OKADA (I.). **On the Relation of some Bolitophilinae to edible Mushrooms.** [*In Japanese.*]—*Oyo-Dobuts. Zasshi* **7** no. 5 pp. 225–233. Tokyo, September 1935.

The mushrooms attacked by these Mycetophilids in Japan are mostly sticky and soft on the surface, and the insects seem to select them by their physical characters. *Bolitophila disjuncta*, Lw., prefers *Armillaria mellea* and sometimes feeds on *Hypholoma sublateritium*; *B. maculipennis*, Wlk., attacks *Pholiota nameko*; *Bolitophilella cinerea*, Mg., feeds mostly on *Pholiota* spp.; and *B. japonica*, Okada, on various fungi, including *Hypholoma* and *Pholiota*.

ODA (F.). **Studies on** *Schoenobius bipunctifer* **Wlk. in Japan.** [*In Japanese.*]—*Oyo-Dobuts. Zasshi* **7** no. 5 pp. 242–261. Tokyo, September 1935.

The history of studies on *Schoenobius bipunctifer*, Wlk., in Japan is discussed, and a bibliography given. The numbers of moths caught by light traps in the Fukuoka Prefecture in late August and early September are recorded to show the density of the population.

SAITO (K.). **On some Problems of Dendro-entomology, III.** [*In Japanese.*]—*Oyo-Dobuts. Zasshi* **7** no. 5 pp. 262–267. Tokyo, September 1935.

This paper, which is one of a series [*R.A.E.*, A **23** 263, 369], discusses the changes in the growth of trees caused by the attacks of some insects.

SATO (T.). **The Food-plants of** *Clania variegata* **Snell. var.** *formosicola* **Strand.** [*In Japanese.*]—*Taiwan no Sanrin* no. 113 pp. 18–21, 1 pl. Formosa, September 1935.

The Psychid, *Clania formosicola*, Strand, is very abundant in Formosa and has one or two generations a year, the adults emerging in February and March and again in September. The larvae feed on the leaves and twigs of over 80 plants, of which *Acacia confusa* and, to a less extent, camphor [*Cinnamomum camphora*] and *Rhus succedanea* are preferred. All stages are described.

SONAN (J.). **On** *Tessaratoma papillosa* **Drury, a great Pest of Litchee in South China.** [*In Japanese.*]—*Formosan agric. Rev.* **31** no. 7 pp. 644–649, 1 fig. Taihoku, July 1935.

The bionomics of *Tessaratoma papillosa*, Dru., on litchee [*Litchi chinensis*] in China and methods of controlling it are reviewed from the literature [*cf. R.A.E.*, A **20** 169, etc.], and all stages are described. This Pentatomid has not been found in Formosa.

LEEFMANS (S.). **Biological Notes on** *Dasynus manihotis* **Blöte.**—*Zool. Meded.* **18** no. 1–3 pp. 237–240, 1 pl., 4 refs. Leiden, 1935.

The Coreid, *Dasynus manihotis*, Blöte, was first observed in Central Java in 1932, when it caused rather serious damage to cassava (*Manihot utilissima*) by sucking the upper parts of the stems, causing the leaves to wither and fall, and killing stems that were much punctured. In the laboratory the eggs were laid under the leaves or on the leaf-stalks and hatched in 7 days. Only three nymphs matured (55–57 days after hatching), and the resulting adults did not reproduce, apparently owing to the lack of appropriate food. The plants in the cage in which they were reared were cassava, bamboo, sweet potato and *Centrosoma* sp., and they were most often seen sucking the pods of the last-named. Nymphs confined to cassava died after the first moult, which occurred 3 days after hatching. Thus the original infestation of cassava was probably a temporary adaptation, particularly as similar damage has not been observed since 1932.

DUMBLETON (L. J.). **Further Note on Pear Midge Parasite.**—*N.Z. J. Sci. Tech.* **16** no. 6 pp. 339–341, 3 refs. Wellington, N.Z., June 1935.

As it was doubtful whether the species of *Misocyclops* introduced into New Zealand as a parasite of *Dasyneura* (*Perrisia*) *pyri*, Bch. (pear midge) is *M. marchali*, Kieff. [*R.A.E.*, A **23** 164], adults were submitted to the Imperial Institute of Entomology, which reported that morphologically they resembled *M. marchali* rather than *M.*

ornatus, Kieff., but that if the larval stages do not agree with those of *M. marchali* it is possible that they may belong to a species different from any of the known Palaearctic forms.

Observations on the extent of parasitism during 1934–35 showed that in Nelson in 1934 midge larvae of the second generation present on 32 out of 50 infested leaves were parasitised as compared with those on 32 out of 66 in 1933. Near Auckland in 1934, 10 of 43 leaves infested with larvae of the first generation and 48 of 50 infested with larvae of the second generation contained parasitised larvae. Details of percentages of parasitism based on rearing of material from different varieties of pear in both localities are shown in a table. The very high rate (63–83 per cent.) of parasitism of larvae of the second generation near Auckland may be due to the presence of a larger midge population, as the percentage of parasitism has been observed to rise or fall with an increase or decrease in the population. The soil in orchards is cultivated more frequently in Nelson than near Auckland; consequently large numbers of midge larvae are destroyed and fewer adults emerge. *D. pyri* began to oviposit about 10th October in 1933 and 1934 in Nelson, but though the parasite emerged early enough in 1933 to parasitise 7 per cent. of the larvae, it emerged too late in 1934 to parasitise any larvae of the first generation. It was not observed in the field until 9th November.

Ward (K. M.). **Winter Control Measures for Fruit Tree Pests.**—*J. Dep. Agric. Vict.* **33** pt. 7 pp. 341–348, 9 figs., 6 refs. Melbourne, July 1935.

Notes are given on the bionomics of a number of insects and mites that attack fruit trees in Victoria and on the use of dormant sprays and other measures for their control in winter. A table shows for each pest the trees attacked, the method of overwintering, the control measures and the time of application.

Bünzli (G. H.). **Untersuchungen über coccidophile Ameisen aus den Kaffeefeldern von Surinam.** [Investigations on coccidophilous Ants from the Coffee Plantations of Surinam.]—*Mitt. schweiz. ent. Ges.* **16** no. 6–7 pp. 453–593, 51 figs., 13 pp. refs. Berne, 1935.

Descriptions are given of the adult males, females and workers of *Acropyga paramaribensis*, Borgm., and *A. rutgersi*, sp. n., together with an account of their biology and ecology. Both species occur in the coffee plantations in Dutch Guiana, *A. paramaribensis* being the commoner.

Of the Coccids found on the coffee, *Rhizoecus coffeae*, Laing, *R. caladii*, Green, *R. moruliferus*, Green, *Geococcus coffeae*, Green, and *Pseudorhizoecus proximus*, Green, were trophobionts of *A. paramaribensis*, and *P. proximus*, *P. migrans*, Green, and *Pseudococcus radicis*, Green, were trophobionts of *A. rutgersi*. Particulars of this association are given.

The presence of *A. paramaribensis* at first favours the growth of the coffee plants by aerating and draining the compact clay soil, but after several years of intensive infestation there is a crop decrease, owing to the feeding of the Coccids associated with the ant. The chief danger, however, is the diffusion of the infectious phloem necrosis.

Subterranean and aerial transport of the Coccids by the ant was observed, and healthy coffee bushes were infected with the necrosis and killed in experiments with the ant and infected Coccids.

The measures advocated as a result of field observations or experiments are : hoeing, to prevent the ants from establishing themselves ; the displacement of the weeds that are food-plants of the Coccids by covering the ground with green manure plants ; keeping the coffee plots free from débris as this encourages superficial root-development in coffee and thus favours the formation of new ant colonies ; the planting of *Erythrina* and bamboo as wind-breaks to impede swarms of ants ; temporary flooding to kill the ants ; and the destruction of colonies with chemicals such as formalin, tar distillate or carbon bisulphide.

Lists are given of Coccids observed in Dutch Guiana on coffee and other plants, and of all the species of insects found in the coffee plantations.

Herrick (G. W.), Griswold (G. H.), Robb (B. B.) & Roehl (L. M.). **A Moth-proof, Gas-tight Closet for the Storage of Clothing and other Woollens.**—*Cornell Ext. Bull.* no. 327 12 pp., 4 figs. Ithaca, N.Y., June 1935.

Plans and directions are given for the construction of a gas-tight cupboard with a content of 50 cu. ft., suitable for the storage of clothing and having a specially fitted door that can be closed quickly and tightly without sealing, in which clothes moths and carpet beetles can be fumigated. A detailed list of the materials and parts required, and notes on the fumigants used are added. Fumigation with $\frac{3}{4}$ U.S. pint of a mixture of ethylene dichloride and carbon tetrachloride [*cf. R.A.E.*, A **20** 416] killed both eggs and larvae of clothes moths and the larvae of carpet beetles. Although 8 oz. paradichlorobenzene killed all stages of the moth [*cf.* **19** 485], it is safer to use 16 oz. Both these fumigants are heavier than air and should be placed above the garments to be fumigated. Naphthalene acts slowly [*cf.* **21** 338], but if used at the rate of $\frac{1}{2}$ lb. in conjunction with 1 lb. paradichlorobenzene, it should safeguard articles placed in the cupboard for several months.

Gilliatt (F. C.). **A Mealy Bug, *Phenacoccus aceris* Signoret, a new Apple Pest in Nova Scotia.**—*Canad. Ent.* **67** no. 8 pp. 160–164. Orillia, August 1935.

A mealybug that was noticed in apple orchards in the Annapolis Valley, Nova Scotia, in 1932 and 1933 and caused a severe infestation in 1934 was identified by DeGryse as *Phenacoccus aceris*, Sign., of which he considers *P. dearnessi*, King, described from hawthorn in Ottawa, to be a synonym. These are the only records of this species in Canada. All stages are briefly described. The females, which oviposit for about a fortnight, lay about 500 eggs each in masses on the limbs and also on the leaves and petioles. In 1933, oviposition began on 8th June and continued for 40 days. Hatching continued from 2nd July to 10th August, and the incubation period was 22–24 days. The young nymphs feed chiefly on the petioles and lower surfaces of the leaves and later on the fruit and smaller limbs. In late July they began to

secrete honey-dew, which caused the growth of sooty fungus on the leaves and fruit. Frequent rains diminished the harm done by the fungus. In 1932 and 1934 infestations in some orchards were so severe that the entire fruit was blackened and the sooty coating could not be removed. The males hibernated as pupae, but the females fed in spring before becoming mature. Many females were destroyed in 1933 by a Coccinellid, and in 1932–33 as many as 75–85 per cent. in some colonies and rarely less than 30 per cent. of the overwintering mealybugs were parasitised by *Allotropa* sp. Nicotine or summer oil sprays applied to the under surfaces of the leaves during the last week of July were effective, but oil sprays in the late dormant period were not so good.

Leech (H. B.). **An Occurrence of *Trichocera garretti* Alex. and a larval Predator (Diptera Trichoceridae and Coleoptera Staphylinidae).**—*Canad. Ent.* **67** no. 8 pp. 182–183, 5 refs. Orillia, August 1935.

Observations are recorded on *Trichocera garretti*, Alex., which was found in British Columbia breeding in numbers in rotting areas in stored roots, particularly mangels and carrots, during the winter of 1931–32 and the following spring. Larvae, and to a less degree, adults of *Quedius molochinus*, Grav., destroyed many of the larvae and pupae. The flies disappeared from the storehouse after precautions had been taken to avoid introducing mangels affected by rot.

Brunetau (J.). **La difficulté de la lutte contre les Scolopendrelles.**—*Rev. Zool. agric.* **34** no. 7 pp. 101–106, 6 refs. Bordeaux, July 1935.

An account is given of experiments on the control of *Scutigerella immaculata*, Newp., infesting newly sown maize in Landes [*cf. R.A.E.*, A **23** 118]. An American variety that grows rapidly appeared more resistant to attack than the local ones. None of the materials tested for soil treatment, which included chemical fertilisers, fumigants and repellents, proved satisfactory. In May 1934, however, promising results were obtained on about $1\frac{3}{4}$ acres of infested ground by coating the previously moistened seed with strained coal ash impregnated with tar. This is prepared by mixing 6 fl. oz. heated coal-tar, 3 fl. oz. kerosene and 1 fl. oz. carbolic acid and stirring the mixture into $2\frac{1}{4}$ lb. ash. A handful was sufficient to treat about 12 lb. of seed, which passed through the sowing machine without clogging the brushes. Infestation was negligible in the treated area, but in a neighbouring untreated field the damage was so severe that re-sowing was necessary. When practicable, deep ploughing before or during the winter helps to destroy the nests situated in the layers of moist soil.

Zones de protection établies contre les progrès du doryphore.—*Rev. Zool. agric.* **34** no. 7 pp. 107–112. Bordeaux, July 1935.

A list is given of the cantons in France that lie wholly or in part within the protective zones [*cf. R.A.E.*, A **22** 511] established against the spread of the Colorado potato beetle [*Leptinotarsa decemlineata*, Say].

DE FLUITER (H. J.) & BLIJDORP (P. A.). **De grauwe dennensuitkever** *Brachyderes incanus* **L.** [The grey Pine Weevil, *B. incanus*.] —*Tijdschr. PlZiekt.* **41** nos. 7–8 pp. 141–211, 7 pls., 3 graphs, 48 refs. Wageningen, 1935; also as *Meded. LandbHoogesch. Wageningen* **39** no. 4 72 pp., 7 pls., 3 graphs, 48 refs. Wageningen, 1935. Price *Fl.*1·75. (With Summaries in German.)

Since 1927 *Brachyderes incanus*, L., has become a pest of pines in Holland [*R.A.E.*, A **21** 375] and has also attacked cherry and plum [**20** 566]. The literature on this weevil is briefly reviewed, with notes on its classification, and all stages are described. Most of the species of the genus *Brachyderes* are found in Mediterranean countries, but *B. incanus* occurs in all wooded regions of Europe and in North America.

In Holland the adults were found in pine stands from 10 to 60 years old. They were active by night, remaining under the ground-litter by day. They appeared in numbers twice a year, the first period beginning at the end of March or early in April, and the second in mid-August. Very few were seen in July and in the first half of August. They hibernated among the ground vegetation, directly under the litter, or in the ground at a depth of 1–2 ins. Radiation with direct sunshine made them more or less active, but they did not feed in winter. A list of the plants they attack is given, with a note of the part injured, which in conifers was the needles, and also the bark in the case of *Pinus sylvestris* and *Larix decidua*. In hawthorn [*Crataegus*], pear, apple, cherry, *Prunus avium* and heather the bark was attacked. Several other plants including oak, beech, hazel and elm were infested. Eggs were laid in the ground in batches of 30–125, the maximum number for a female being 1,241. They hatched in 32 days at 15°C. [59°F.], 17 at 18°C. [64·4°F.], 13½ at 20°C. [68°F.], 10 at 24°C. [75·2°F.], 8½ at 30°C. [86°F.] and 8 at 32°C. [89·6°F.]. Only a few hatched at 33°C. [91·4°F.], after 7 days. Mortality was very slight between 20 and 30°C., but increased at lower temperatures, though eggs developed even at a constant temperature of 10°C. [50°F.]. Air humidity had no effect so long as the substance cementing the eggs was present. The larvae bored into the roots of the plants on which the adults lived. When newly-hatched, they were positively phototropic and negatively geotropic, but if in contact with a loose medium they moved to the roots. The pupal period lasted three weeks, and the adults began to oviposit about a fortnight after they emerged. In trap-bands, males were twice as numerous as females. Eggs and larvae were found in nature throughout the year.

Spiders and a fossorial wasp, *Cerceris arenaria*, L., were predacious enemies. The parasites observed were the Tachinid, *Rondania dimidiata*, Mg., the Braconids, *Pygostolus multiarticulatus*, Ratz., and the very closely related *P. falcatus*, Nees, and the fungi, *Hirsutella fusiformis* and *Beauveria bassiana*. Observations on *R. dimidiata* and *P. multiarticulatus* have been noticed [**22** 433]. *P. multiarticulatus* was able to reproduce parthenogenetically, all the progeny being males. The mortality due to *H. fusiformis* was slight.

Experiments in control were made with several sprays and dusts. The best results were obtained with sodium fluoride (5 lb. in 100 gals.), while Paris green (1 lb. in 100 gals.) and some proprietary dusts gave very variable results. Insecticides are not advocated.

It was noticed that stands without undergrowth and exposed to much sunshine were those most attacked by *B. incanus*, which did no noticeable injury in stands where the ground litter was kept moist by a dense undergrowth of heather.

WAHLGREN (E.). **Cecidiologiska anteckningar. III. Aphidina.** [Notes on Galls.]—*Ent. Tidskr.* **56** no. 1–2 pp. 1–42, 39 refs. Stockholm, 1935.

Notes are given on a large number of Aphids that cause galls, rolling of the leaves, and other malformations of foliage or stems of trees and other plants. An alphabetical list of the plants shows the species occurring on each. Some of the species are recorded for the first time from Sweden.

TRÄGÅRDH (I.). **Mjuka trägnagaren som skadedjur på papper.** [*Ernobius mollis* attacking Paper.]—*Skogen* no. 1 p. 14, 1 fig. Stockholm, 1934. [Recd. October 1935.]

Injury caused by the Anobiid, *Ernobius mollis*, L., to sheets of sulphite paper 56 × 79 cm. in Sweden is described. The bales had been packed in frames of wood with bark on it and left for several months.

TRÄGÅRDH (I.). **En fläskänger som skadegörare i lådbräder.** [*Dermestes peruvianus* attacking Box-boards.]—*Skogen* no. 23 pp. 514–515, 8 figs. Stockholm, 1934. [Recd. October 1935.]

Injury caused by larvae of *Dermestes peruvianus*, Lap., in box-boards of spruce is described. The boards were sent to Sweden from a London firm that imports preserved meat from South America. The larvae had not attacked the wood to feed, but had excavated their pupal chambers to such an extent that a piece measuring 18 × 24 cm. harboured more than 230 holes. The wood was very soft, the annual rings averaging 7 mm. in width.

TRÄGÅRDH (I.). **Kort översikt över trägnagande insekter inomhus.** [A Short Review of Wood-eating Insects in Buildings.]—*Skogen* no. 8 pp. 170–173, 7 figs. Stockholm, 1934. [Recd. October 1935.]

A brief survey is given of the commoner insects that infest timber in buildings in Sweden, with descriptions of the adults and larvae and figures of the injuries they cause. They are divided into 3 groups. Species of the 1st group are introduced as larvae or pupae in timber and planks. When the adults emerge, they leave the house as soon as possible as they cannot attack worked timber. The most important are *Monochamus sutor*, L. (pine sawyer) and the wood-wasps (*Sirex*), and they only occur in timber taken from dead or dying trees or from logs that have been left unbarked in the forest during the summer. Species of the 2nd group, of which *Callidium violaceum*, L., and *Ernobius mollis*, L., are important examples, only attack wood with adhering bark, but can live in the houses for a few years until they have utilised the limited food-supply. Species of the 3rd group,

which do not depend on the presence of bark, oviposit in cracks in the wood, and the larvae feed in the interior. Hence they generally become chronic pests. The commonest representatives are *Hylotrupes bajulus*, L., and *Anobium punctatum*, DeG. (*striatum*, Ol.).

Notes are also given on *Lyctus linearis*, Gze. (*canaliculatus*, F.) and the injury it causes to oak timber.

TRÄGÅRDH (I.). **De trägnagande insekternas skadegörelse i vara byggnader.** [The Damage done by wood-eating Insects in our Buildings.]—*Byggmästaren* no. 15 allmänna uppl. 10, pp. 83–92, 12 figs. Stockholm, 1935.

A short illustrated key to the more common wood-eating insects [see preceding paper] was sent out with a questionnaire to about 7,000 persons who had care of government buildings in the southern province, Götaland. Of 2,148 questionnaires returned, 990 contained fairly detailed answers, and numerous samples of infested wood were received. The four most common species were *Callidium violaceum*, L., *Ernobius mollis*, L., *Anobium punctatum*, DeG. (*striatum*, Ol.) and *Hylotrupes bajulus*, L. When wood with a considerable amount of bark is used in buildings, *E. mollis* may become very obnoxious, on account of the numbers of exit holes that appear in the surface.

In the areas along the coast the percentage of infested buildings was about twice as high as in those inland, although the climate seems hardly likely to influence the activity of any of these insects indoors. The mean temperature during February, the coldest month, is −1·25°C. [29·6°F.] in the coastal and −3·06°C. [26·5°F.] in the inland areas, and the yearly mean temperature is at least 6·5°C. [43·7°F.] in the former, and only about 5·4°C. [41·7°F.] in the latter. When the investigation is carried on further northwards, it will be easier to estimate the importance of climatic factors. Possibly the more frequent infestation in the coastal areas indicates that infestation depends on the density of the houses. The population is twice as dense in these areas and the percentage of mean infestation is 49·8 as compared with 25·6 inland. The data obtained suggest that *Anobium punctatum* is four times as common as *Hylotrupes bajulus*, but they may be unreliable, because it is far easier to detect the former insect than the latter, which is more concealed and prefers the least accessible parts of buildings. *Hylotrupes* was found in nine of ten churches from which no injuries had been reported. Houses with tiled roofs were only half as often attacked by *Hylotrupes* as those with iron roofs. Liability to infestation by *Anobium* or *Hylotrupes* appeared to increase with the age of the house up to 30 years, after which it was constant.

TRÄGÅRDH (I.). **Sälglövbaggen som skadegörare på björkkultur.** [*Lochmaea capreae* a Pest of Birch Plantations.]—*Skogen* no. 3 pp. 59–60, 2 figs. Stockholm, 1935.

The Galerucid, *Lochmaea capreae*, L., has been observed attacking young birch plantations in drained swamps in the south of Sweden. It is probable that its normal food-plants are willow and poplar, and that they are so severely damaged on drained swamps that it is forced to attack the birches. It hibernates in the ground and has about two generations a year in Sweden.

Oldham (J. N.). **Further Observations on the Incidence of Parasitism of Flea Beetles by the Nematode,** *Howardula phyllotretae.*—*J. Helminth.* **13** no. 3 pp. 163–166, 1 ref. St Albans, July 1935.

Further investigations on the incidence of infestation of various species of *Phyllotreta* by *Howardula phyllotretae*, Oldham [*R.A.E.*, A **21** 447] were carried out in England in 1932 and 1933, collections being made from April to September to cover the period of activity of the insects. The absence of parasitism in *P. nemorum*, L., was confirmed, the larval habits being still considered the only feasible explanation [*loc. cit.*]. In both years both sexes of *P. atra*, F., *P. nigripes*, F., and *P. undulata*, Kutsch, were parasitised. *P. cruciferae*, Gze., was only lightly parasitised in 1932 and not at all in 1933. In all species, the rate of parasitism was slightly higher in the males. Variation in the incidence of parasitism in individual years was marked, especially in the case of *P. undulata*. The percentage of adults of this species parasitised was 74 in 1931 [*loc. cit.*], 60 in 1932 and 24 in 1933. *P. atra* similarly showed a decrease from 11·36 per cent. in 1931 to 4·67 per cent. in 1933. In *P. nigripes* the percentage increased from 10 in 1931 to 13·33 in 1933. The average percentage for all species was about 26 in 1931, 38 in 1932 and 16 in 1933, this fluctuation being possibly connected with climatic conditions. Temperatures were normal in 1931 and 1932, and high in 1933 ; rainfall was normal in 1931, rather high in 1932, and low in 1933.

Parasitism of the beetles by Hymenoptera was also investigated, and the data are incorporated in a table that shows details of Nematode infestation. The percentage was low and of little significance, and of the 3,400 beetles examined, only 4 harboured both Hymenopterous and Nematode parasites.

Kearns (H. G. H.). **Insect Pests of Gardens in the Bristol District and how to control them.**—*Proc. Bristol Nat. Soc.* (4) **7** (1934) pp. 542–548. Bristol, 1935.

This is a useful account of the methods of using insecticides for the control of the common pests of fruit trees, bush fruits, vegetables and flowering plants in England. A section on winter washes includes a table indicating to what extent various pests of fruit trees and currants are controlled by different concentrations of tar distillate, petroleum oil emulsion, or combinations of the two, and another showing the concentrations and times of application recommended for each kind of tree, etc. Nicotine and lead arsenate are considered the best insecticides for spring sprays on apple, but if their poisonous nature precludes their safe use, a spray of 4 oz. ground derris root (containing 1·5 per cent. crystalline rotenone) in 10 gals. water may be employed as a substitute. If satisfactory control of the codling moth [*Cydia pomonella*, L.] is required, it is necessary to add colloidal sulphur and colloidal barium fluosilicate (at concentrations recommended by the manufacturers) with soap or other wetting agent.

Ingram (J. W.), Bynum (E. K.) & Douglas (W. A.). **Control of the Sugar Cane Beetle.**—*Sugar Bull.* **13** no. 21 pp. 4–5. New Orleans, La., 1st August 1935.

The results of 4 years' study in Louisiana on the control of *Euetheola rugiceps*, Lec., the adults of which destroy young sugar-cane plants in

spring by attacking them just below the soil surface [*R.A.E.*, A **20** 635], are discussed. Losses in yield of sugar-cane, which were estimated at 25,000 tons in 1933, were 40–50 per cent. less in 1934 than during the preceding 3 years. This reduction was due to stimulation of growth by heavy rainfall at the time of beetle injury, to the use of light traps, and to more extensive planting of varieties that produce a greater number of plants to the acre. The use of such varieties, which give a good stand in spite of injury by the beetles, is considered the best means of reducing it. Co. 290 is the best variety for this purpose. Ploughing sod areas between April and June greatly decreases the numbers of larvae breeding in them. Although actual injury to sugar-cane is caused only by the adults, it is desirable to control the Dynastid in the larval stage. Soil examinations have shown that it breeds little in areas covered by plants that hinder the development of sod-forming grasses, and the planting of trees and sweet clover (*Melilotus indica*) near sugar-cane to eliminate the sod is recommended. Bermuda grass [*Cynodon dactylon*] in cane-fields should also be destroyed as the larvae tend to be more numerous where it occurs.

Large numbers of beetles were collected in 1933 and 1934 by using 500-watt lights operated by portable generating plants. On one plantation 76,184 beetles were taken at 15 lights between 2nd April and 14th June 1934, and as many as 14,375 were collected in one night. Although no exact estimate of the value of the method can be made, it seems certain that it has been of benefit in heavy infestations; and as about half the beetles collected were females, a reduction in the following year's infestation should have been effected. As most of the beetles coming to lights land several feet away from them, it is necessary to collect them by hand, only a few being caught in containers filled with oil and water under the lights. The numbers of beetles taken do not justify the operation of lights after 9 p.m. Over 100 beetles a night have been collected at motor-car lights.

PARK (T.). **Sterilisation of *Tribolium* by high Temperature.**—*Science* **82** no. 2125 pp. 281–282, 1 ref. New York, 20th September 1935.

While *Tribolium confusum*, Duv., was being reared at a constant temperature of 28°C. [82·4°F.], an accident caused the temperature to which some of the 3rd and 4th instar larvae were exposed to rise to 39°C. [102·2°F.] in about 5 hours. As a result, the larvae were unusually active, but they completed their development at 28°C. and produced apparently normal adults. When these were paired, however, and kept in flour under conditions under which normal adults reproduced readily, only 3 or 4 females out of 50 oviposited in 25 days, and the total number of eggs laid was very small, though they were as viable as normal eggs. This suggests that fecundity was affected by the high temperatures and not fertility [*cf. R.A.E.*, A **23** 279].

PAPERS NOTICED BY TITLE ONLY.

TRÄGÅRDH (I.). **Ueber die Organisation der forstlichen Entomologie in Schweden.** [On the Organisation of Forest Entomology in Sweden.]—*Arb. physiol. angew. Ent. Berl.* **2** no. 2 pp. 87–93. Berlin, 15th July 1935.

Tullgren (A.). **Die Organisation der landwirtschaftlichen Entomologie in Schweden.** [The Organisation of agricultural Entomology in Sweden.]—*Arb. physiol. angew. Ent. Berl.* **2** no. 2 pp. 93–96. Berlin, 15th July 1935.

Wade (J. S.). **A Contribution to a Bibliography of the described immature Stages of North American Coleoptera.**—*E-358*, 114 pp. mimeogr. Washington, D.C., U.S. Dep. Agric., Bur. Ent. September 1935.

Börner (C.) & others. **Schnabelkerfe, Rhynchota (Hemiptera).** [Keys to the Genera and Species of Rhynchota of Central Europe.]—*Tierwelt Mitteleur.* **4** i. Teil, 3 Lief., x, 262 pp., 560 figs., 20 refs. Leipzig [1935].

Hall (W. J.). **Observations on the Coccidae of Southern Rhodesia.—VII** [including 4 new species and 1 new variety.]—*Stylops* **4** pt. 10 pp. 217–226, 4 figs. London, 15th October 1935. [*Cf. R.A.E.*, A **23** 343.]

James (H. C.). **New Coccidae (Hem.) from Kenya** [3 new species].—*Stylops* **4** pt. 10 pp. 233–237, 3 figs. London, 15th October 1935.

[Mordvilko (A. K.).] **Мордвилко (А. К.). Distribution of Aphids and their Food-plants in Europe.** [*In Russian.*]—*Bull. Acad. Sci. U.R.S.S.* no. 3 pp. 419–424. Leningrad, 1935. (With a Summary in German.)

Murayama (J.). **Examens sur les animaux forestiers, avec une liste de littérature concernant l'entomologie forestière de la Corée.** [*In Japanese.*]—*Spec. Publ. For. exp. Sta. Govt.-Gen. Chosen* 34 pp. Keijo, 1934. [Recd. September 1935.]

Schedl (K. E.). **Fauna Philippinensis (Platypodidae et Scolytidae), III** [including 9 new species].—*Philipp. J. Sci.* **56** no. 3 pp. 395–403. Manila, 1935.

Takahashi (R.). **Additions to the Aphid Fauna of Formosa (Hemiptera), III** [including 4 new species].—*Philipp. J. Sci.* **56** no. 4 pp. 499–507, 3 figs. Manila, 1935. [*Cf. R.A.E.*, A **22** 312.]

List of Publications on Indian Entomology, 1933.—*Misc. Bull. Coun. agric. Res. India* no. 5 29 pp. Delhi, 1935. Price 1*s.* [*Cf. R.A.E.*, A **22** 592.]

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